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# THE PRACTITIONER

## CONTENTS

VOL. CXXXIX JULY, 1937

PAGE

OLD AGE ... 1
By Sir Robert Armstrong-Jones, C.B.E., M.D., D.Sc., F.R.C.P., D.L.

THE MANAGEMENT OF DISORDERS OF THE NERVOUS SYSTEM IN OLD AGE ... 11
By Douglas McAlpine, M.D., F.R.C.P.
*Physician, Department for Nervous Diseases, and Lecturer in Neurology, Middlesex Hospital; Physician, Hospital for Epilepsy and Paralysis, Maida Vale.*

RESPIRATORY DISEASES IN OLD AGE ... 21
By Geoffrey Marshall, O.B.E., M.D., F.R.C.P.
*Physician, Guy's Hospital; Assistant Physician, Brompton Hospital for Diseases of the Chest.*

RHEUMATISM IN ADVANCING YEARS ... 28
By Charles W. Buckley, M.D., F.R.C.P.
*Physician, Devonshire Royal Hospital, Buxton, and the Buxton Clinic for Rheumatic Diseases.*

THE SURGERY OF OLD AGE ... 37
By Geoffrey Keynes, M.D., F.R.C.S.
*Assistant Surgeon, St. Bartholomew's Hospital.*

DIET IN OLD AGE ... 46
By Hugh Dunlop, M.D., M.Sc., M.R.C.P.
*Assistant Physician, Charing Cross Hospital; Lecturer in Pharmacology, King's College, London.*

NURSING AND CARE OF THE BEDRIDDEN PATIENT ... 55
By Miss E. C. Pearce.
*Sister-Tutor, The Middlesex Hospital.*

DIET IN HEALTH AND DISEASE: I.—PRACTICAL DIETETICS ... 63
By V. H. Mottram, M.A.
*Professor of Physiology in the University of London and Head of the Departments of Physiology and Dietetics, King's College of Household and Social Science, Kensington.*

RADIOLOGICAL INTERPRETATION OF OBSCURE PULMONARY LESIONS ... 78
By J. B. McDougall, M.D., F.R.C.P.E., F.R.S.E.
*Medical Director, Preston Hall, Aylesford, Kent.*

MEDIASTINAL PLEURAL EFFUSION: WITH NOTES ON FOUR CASES ... 83
By F. G. Nicholas, M.B., B.S., D.M.R.E.
*Consulting Radiologist to the London County Council at the Archway and St. Luke's Hospitals; and*
T. A. Fraser, M.D.
*Assistant Medical Officer, Archway Hospital.*

TRACTOR SICKNESS ... 90
By E. I. Puddy, M.B., B.S., M.R.C.S., L.R.C.P.
*Litcham, Norfolk.*

EDITORIAL ... 94

[CONTINUED ON PAGE IV.

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CONTENTS—*Continued.*

PAGE

PRACTICAL NOTES :—

The Use of Carbon Dioxide in Early Pneumonia ... 95
New Uses for Auto-Hæmotherapy ... 95
Prophylaxis of Whooping Cough ... 96
Prontosil in Dermatology ... 97
Blood Transfusion : A Closed Method of Collection and Administration ... 97
The Aschheim-Zondek Test and Cerebral Tumours ... 98
Optochin in the Treatment of Pneumonia ... 99
Alkaloid Treatment of the Common Cold ... 99

REVIEWS OF BOOKS :—

Trauma and Disease (Brahdy and Kahn) ... 100
Chronic Miliary Tuberculosis (Hoyle and Vaizey) ... 100
Diagnosis and Non-Operative Treatment of the Diseases of the Colon and Rectum (Schwarz, Goldberger and Crocker) ... 100
Diseases of the Newborn (Tow) ... 101
The Diagnosis and Treatment of Diseases of the Liver and Biliary Tract (Phillips and Haden) ... 101
Prognosis, Vol. 2 ... 102
Immortal Names and other Poems (Parry) ... 102
Rose and Carless Manual of Surgery (Wakeley and Hunter) ... 102
Tweedy's Practical Obstetrics (Solomons and Falkiner) ... 103
Common Skin Diseases (Roxburgh) ... 103
Hale-White's Materia Medica (Douthwaite) ... 103
The Diabetic Life (Lawrence) ... 103
Favourite Prescriptions (Ward) ... 103
Mental Deficiency (Treadgold)... 103

NOTES AND PREPARATIONS :—

Society for Relief of Widows and Orphans of Medical Men ... 104
Examen (Glaxo Laboratories, Ltd.) ... 104
Lemon Barley Powder (George Borwick and Sons, Ltd.) ... 104
Seedlax (Seedlax Co.) ... 104

CURRENT MEDICAL LITERATURE ... lxxii
NOTES BY THE WAY ... i
APPOINTMENTS ... lxxxii

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# THE PRACTITIONER

## CONTENTS

VOL. CXXXIX AUGUST, 1937

23-8-

PAGE

IMMUNIZATION AGAINST DISEASES IN THE TROPICS... ... ... ... .. .. ... 105
By G. M. Findlay, C.B.E., M.D., Sc.D.
*Wellcome Bureau of Scientific Research, London.*

INVESTIGATION OF CASES OF OBSCURE FEVER .. ... . ... .. ... ... 115
By Philip Manson-Bahr, D.S.O., M.D., F.R.C.P.
*Physician, Hospital for Tropical Diseases; Consulting Physician to the Colonial Office and Crown Agents for the Colonies.*

THE MEDICAL ORGANIZATION OF AIR RAID PRECAUTIONS .. ... ... ... ... 131
By William C. Bentall, O.B.E., F.R.C.S.
*Assistant Surgeon-in-Chief, St. John Ambulance Brigade.*

AIR WARFARE AND THE GENERAL PRACTITIONER ... ... ... ... .. . . ... 139
By L. Haden Guest, M.R.C.S., L.R.C.P.
*Formerly Medical Instructor, Air Raid Precautions Department, Home Office.*

THE DIAGNOSIS AND TREATMENT OF POISONING ... . ... ... . . ... ... 149
By Sir William Willcox, K.C.I.E., C.B., C.M.G., M.D., F.R.C.P.
*Consulting Physician, St. Mary's Hospital ; Medical Adviser to the Home Office.*

THE SUICIDAL IMPULSE AND THE VALUE OF PSYCHOLOGICAL TREATMENT ... . . 168
By Hilda Weber, M.D., B.S., B.Sc. (Psychol.), D.P.M.
*Physician, the Tavistock Clinic, and the British Hospital for Functional, Mental and Nervous Diseases.*

URINARY TUBERCULOSIS : ITS SYMPTOMS AND SIGNS ... ... . . ... . . 178
By T. E. Hammond, F.R.C.S.
*Consulting Urologist, the Welsh National Memorial Association ; Surgeon, the Royal Infirmary, Cardiff.*

AGRANULOCYTOSIS ... ... ... ... ... . . ... ... ... .. ... ... 185
By C. Gaulter Magee, M.R.C.P.E., D.P.H.
*Assistant Medical Officer, Salford Royal Hospital.*

DIET IN HEALTH AND DISEASE : II.—SICK ROOM MENUS AND RECIPES ... . . ... 192
By R. H. Wansbrough, S.R.N.
*Sister Dietitian, St. Thomas's Hospital*

NOTES AND QUERIES :—

Vibro-Massage ... ... ... ... ... . . ... .. ... ... ... ... 202
The Best Milk for Children ... ... ... .. ... ... ... ... ... . . 202
Greasing the Scalp in Hay Fever ... ... ... ... ... ... ... . . 202
The Treatment of Round-worms ... ... ... ... . .. ... ... ... 203

[CONTINUED ON PAGE IV.

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## CONTENTS—*Continued.*

PAGE

PRACTICAL NOTES :—

The Modern Treatment of Malaria ... 204
Adrenaline and the Splenomegaly of Malaria ... 204
Alkalosis in the Treatment of Peptic Ulcer ... 205
The Treatment of Mastitis with Testosterone ... 206
Tannic Acid—Silver Nitrate Treatment of Burns ... 206
The Use of Urea in the Treatment of Infected Wounds ... 207

REVIEWS OF BOOKS :—

The Control of Tuberculosis in England, Past and Present (Kayne) ... 208
Organization, Strategy and Tactics of the Army Medical Services in War (Nicholls) ... 209
If Air War Comes : A Guide to Air Raid Precautions and Anti-Gas Treatment (Guest)... 209
Psychiatry for Practitioners (Christian) ... 209
Principles of Medical Statistics (Hill) ... 210
The Riddle of Napoleon (Brice) ... 210
Skin Diseases in General Practice (Haldin-Davis) ... 211
Muir's Bacteriological Atlas (van Rooyen) ... 211
The Treatment of Diabetes Mellitus (Joslin) ... 211
Handbook of Diets (Simmonds) ... 211
Clinical Contraception (Cox) ... 211

NOTES AND PREPARATIONS :—

Antostab (Boots Pure Drug Co , Ltd.) ... 212
Percalcin (Evans Sons Lescher & Webb, Ltd.) ... 212
Bad Nauheim ... 212
The Medical Directory (J. A. Churchill, Ltd.) ... 212

CURRENT MEDICAL LITERATURE ... lxiv
NOTES BY THE WAY ... xlvi
APPOINTMENTS ... lxxiv

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# THE PRACTITIONER

## CONTENTS

VOL. CXXXIX SEPTEMBER, 1937

PAGE

THE PSYCHOLOGY OF MOTORING ... ... ... ... . ... .. . . ... 213
By Millais Culpin, M.D., F.R.C.S.
*Professor of Medical Industrial Psychology, London School of Hygiene and Tropical Medicine.*

VISION AND THE MOTORIST ... ... ... ... ... ... ... ... ... ... 218
By N. Bishop Harman, M.B., LL.D., F.R.C.S.
*Consulting Ophthalmic Surgeon, West London Hospital ; Lecturer in Ophthalmology, West London Postgraduate College.*

FUME POISONING AND MOTORING ... ... ... ... . ... ... . . ... 225
By Sir William Willcox, K.C.I.E., C.B., C.M.G., M.D., F.R.C.P.
*Consulting Physician, St. Mary's Hospital ; Medical Adviser to the Home Office.*

ALCOHOL AND THE MOTORIST ... ... ... ... ... ... ... ... ... ... ... 232
By Alexander Baldie, M.B., D.P.M.
*Honorary Psychotherapist, West End Hospital for Nervous Diseases ; Divisional Surgeon, Metropolitan Police.*

COMMON INJURIES AND ACCIDENTS DUE TO MOTORING ... ... . . ... ... ... 238
By A. M. A. Moore, F.R.C.S.
*Assistant Surgeon and Assistant Orthopædic Surgeon, London Hospital ; Surgeon, Poplar Hospital for Accidents; Assistant Surgeon with charge of the Orthopædic Department, King George Hospital, Ilford.*

---

ADMINISTRATION OF FLUIDS ... ... ... ... . . ... ... ... . ... 250
By H. L. Marriott, M.D., M.R.C.P.
*Assistant Physician, the Middlesex Hospital, and the Millar General Hospital, and*
A. Kekwick, M.B., B.Ch.
*Resident Medical Officer, the Middlesex Hospital.*

ORTHOPÆDIC SURGERY IN THE TREATMENT OF RHEUMATISM AND RHEUMATOID ARTHRITIS ... ... ... ... ... ... ... ... ... ... ... ... 271
By Gordon O. Tippett, F.R.C.S.
*Chief Assistant Orthopædic Department, Croydon General Hospital ; Assistant Orthopædic Department, St. John Clinic of Physical Medicine, and the Arthritic Unit of the London County Council.*

PHRENIC PARALYSIS IN THE TREATMENT OF CERTAIN THORACIC COMPLICATIONS OF SUBDIAPHRAGMATIC INFECTION ... ... ... ... ... ... ... ... ... ... 279
By Robert Coope, M.D., B.Sc., M.R.C.P.
*Physician to Out-Patients, Liverpool Royal Infirmary; Physician, Liverpool Hospital for Consumption and Diseases of the Chest, and*
Hugh Reid, M.B., F.R.C.S.
*Surgeon to Out-Patients, Liverpool Royal Infirmary; Thoracic Surgeon, North Wales Sanatorium.*

URINARY DISEASE ASSOCIATED WITH NERVOUS DISEASE ... ... ... ... ... .. 285
By A. Ralph Thompson, Ch.M., F.R.C.S.
*Consulting Urologist, Guy's Hospital.*

---

DIET IN HEALTH AND DISEASE: III.—DISPENSING SPECIAL DIETS ... ... .. ... ... 291
By Margery Abrahams, M.A., M.Sc.
*Dietitian, St. Bartholomew's Hospital, London.*

[CONTINUED ON PAGE IV.

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CONTENTS—*Continued.*

PAGE

NOTES AND QUERIES :—

Bad Debts ... 300
Mackintosh and Drawsheet ... 300
Artificial Pneumothorax ... 301

PRACTICAL NOTES :—

The Citrate Method of Blood Transfusion ... 302
Ambulatory Treatment of Phlebitis ... 302
Sulphonamide in Gonococcal Infection ... 303
Present-Day Diagnosis of Epidemic Infantile Paralysis ... 303
The Treatment of Rheumatic Endocarditis ... 304
Foreign Bodies in the Ear and their Removal ... 305
A Simple Pliable Finger Splint ... 306
Whole Blood Treatment for Pneumonia ... 306

REVIEWS OF BOOKS :—

The Citadel (Cronin) ... 307
Drug Addiction (Adams) ... 307
Treatment of Some Chronic and "Incurable" Diseases (Todd) ... 308
Modern Psychology in Practice (Neustatter) ... 308
Physical Diagnosis (Sutton) ... 309
Modern Dietary Treatment (Abrahams and Widdowson) ... 309
Reports on Chronic Rheumatic Diseases (Buckley) ... 309
Textbook of the Practice of Medicine (Price) ... 310
Diseases of the Heart (Lewis) ... 310
The Abdominal Surgery of Children (Barrington-Ward) ... 310
The Diagnosis of Nervous Diseases (Purves-Stewart) ... 310
Disorders of the Blood (Whitby and Britton) ... 310
Surgery of the Sympathetic Nervous System (Gask and Ross) ... 311
Medical Emergencies (Newman) ... 311
Synopsis of Obstetrics and Gynæcology (Bourne) ... 311
Minor Maladies and their Treatment (Williams) ... 311
Recent Advances in Pulmonary Tuberculosis (Burrell) ... 311

NOTES AND PREPARATIONS :—

Measles Serum ... 312
Allenburys Sulphonamide P (Allen and Hanbury, Ltd.) ... 312
Alomin (Eli Lilly & Co., Ltd.) ... 312
Betalin Compound (Eli Lilly & Co., Ltd.) ... 312
Gluco-Fedrin (Parke, Davis & Co.) ... 312

CURRENT MEDICAL LITERATURE ... lxxvi

NOTES BY THE WAY ... xlviii

APPOINTMENTS ... lxxxvi

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# OLD AGE

BY SIR ROBERT ARMSTRONG-JONES, C.B.E., M.D., D.Sc., F.R.C.P., D.L.

THE writer of this article has himself exceeded the Psalmist's limitation of days and he therefore fulfils the parody of Boswell, " he who drives fat oxen should himself be fat," for he has not only witnessed in others, but he has himself experienced the joys and sorrows, the hopes and disappointments, the health and some of the ailments of those in whose company he has climbed the hill of life, and who now, under the weight of years, may presumably be making strides as travellers down the other side of this uncertain slope. The scholarly contribution of Sir Humphry Rolleston " Medical aspects of old age " (p. 147) refers to Ecclesiastes, Chapter XII., an essay on the subject of old age and wisdom from the sapience of Solomon " and they shall be afraid of that which is high," as possibly interpreting the dyspnœa on climbing a hill, which old people experience.

It has, however, been remarked that " Life is a matter of compensation and equilibrium." What you lose on the swings you gain on the round-abouts! Such a paradox was illustrated by Cicero in his essay on "Old age." The *de Senectute* was written by Cicero as an imaginary dialogue between Cato (who lived a century earlier) and two young men, Scipio (honoured by the appellation Africanus) and Lælius (designated Sapiens). Cato died at the age of eighty-four. He had enjoyed during his life a wonderful record of usefulness, gracefulness, and honour. When over eighty, he is made to say in the dialogue that, in spite of being disqualified at his age for active employment through a weakening of the bodily strength, and in spite of a slight impairment of sight and hearing—the latter the first sense to go in old age—all of which, he remarked, demonstrated to him that he was drawing nearer the end, he nevertheless took part in the debates of the Senate. He was also beginning to collect material for a history of Rome and at this age he began to learn Greek. Further, he could still enjoy a country dinner party and had been thinking of taking lessons on the lyre, declarations which caused Montaigne to exclaim, "such an old age makes one long to grow old." The longing to grow old is not much in evidence to-day, as may be witnessed at the clinic of M. Voronoff, on the French-Italian frontier, which I was privileged to attend, where to be young is the ardent longing, as it was with Faust when youth was believed to be attained through wizardry and sorcery. Through the teaching of Voronoff men and women past their climacteric—when the embers of life begin to cool—invoke surgical aid and seek the aid of operative measures by the transplantation into their tissues of reproductive glands (gonads) from animal sources, thus, it is claimed, inviting physiology to their rescue from senility. Such a desire for rejuvenescence is apparent nearer home than the clinic of M. Voronoff, as may be seen in the many advertisements for face lifting, the demand for platinum and bobbed hair and admission into beauty parlours and salons. So great, to-day, is the desire to be young, that it has become the general fashion to affect juvenility, not only in complexion and facial appearance, but in dress, taste, and deportment; yet the enlarged experience of the elderly still counts for much of the charm of age with its dignity, reticence, and authority. The elderly, it is satisfactory to realize, are still sought after by the young whenever trouble arises or anxiety develops. As Bacon said " the young are more fitted to invent than to judge."

As to the onset of old age, it is difficult to say when it begins or to fix its limitations, although many attempts have been made to divide and classify the different periods of life; for example, babyhood, infancy, childhood, puberty and adolescence, each has its own special characteristics. The period of maturity has also been mentioned, which some like Peter

Pan never reach, although they pass into old age, which has its own special signs and indications, its own physical and mental symptoms. But it is necessary for our purpose, if possible, to fix a boundary between this and the other periods of life. It is known, for instance, that the period of adolescence is marked by fundamental physical changes, which are associated with corresponding mental changes, for at this age there is a general expansion of the emotional life. It is a period of hopes and ideals. Psychiatrists who have to treat the abnormalities of the period of youth, as also the teachers of the young, know that unless this period is supervised, disciplined and controlled, old age will be a time of disaster, even if wreckage does not happen earlier.

In order to have a happy old age the period of youth must receive special care and direction. Precept may point the way, but it is of little influence without the accompaniment of a good example, and experience has learnt to reverse the aphorism "Do as I say". Example and precept are both essential in the control of youth, which is the counterpart of the spring season of the year, the seeds of wise counsel and salutary example must be sown in early life, remembering that youth is the period of intense friendship and pledges, apt to lead to violent affection with disastrous results, impossible to be revoked or repealed and to be deplored for the rest of life. It is further necessary to consider the period of childhood and to recall the Jesuit maxim "Give me the child for the first seven years, anyone can have it after". The home with its affection, industry, discipline, and self-control is the nucleus of the national character, and it is true to say that the nation comes from the nursery. The increase of juvenile crime is attributed to lessened home influence.

## SIGNS AND SYMPTOMS

The signs of old age are extremely variable, depending upon personal idiosyncrasies, habits and customs, but the traditional symptoms of general loss of adaptation, a failure to preserve recent impressions or to acquire new facts—which, indeed, soon fade—a narrowing of the emotional life and a limitation of the associative mechanisms constitute the chief. Some would add an impairment of the critical faculties, although there are notable and brilliant exceptions to these which need not be mentioned, men and women whose minds remain clear, able and unfettered by any infirmity until 80 or 90, and even beyond.

The physiology of old age is as unique and interesting as is that of infancy and adolescence, for there are definite natural changes in senility which affect the brain as it does every other organ in the body, and these are due to a general diminution of nutritive activity. The blood vessels lose their normal elasticity and resilience, their coats become thickened or calcareous (endarteritis and atheroma), so that their calibre is smaller, a smaller amount of blood passes through them, and the nutrition of the organs is impaired. As a consequence of these physical changes in the brain, mental abnormalities also occur, which Bevan Lewis well described as an "obnubilation" a cloudiness, haziness, or dimness of the mind. These changes, with their extreme multiplicity, also bring about an impairment of the other functions of the body, which has become less supple and active. The onset of a natural old age thus implies not only a certain degree of physical passivity and a withdrawal from active striving, but also some slight diminution of mental response. On the physical side the lessened activity does not amount to the lethargy or the heaviness and torpor of decay, nor does the impairment of mental powers amount to the enfeeblement of dementia, in other words, the condition is physiological and not pathological. It is not senile dementia, an affection of all the mental faculties which undergo progressive deterioration, but a natural process of involution.

With the onset of old age there is a slight dullness of all the senses, which lose their sharpness, and in particular the sense of hearing, the more distant vibrations fail to be appreciated, and "what did you say?" is repeated. This, as stated, is the first sense to go in advancing years, and deafness may proceed to the painful disability of "social isolation". The next sense to be impaired is the sense of sight and presbyopia or "long-sightedness" is then experienced. It is noted by the increasing distance at which type, for reading, is held before the eyes. The reader often boasts that his sight is better than ever, as he states he can now read clearly at a further distance than hitherto, a sure sign of the need for spectacles, which should be ordered at once. This impairment of the senses, together with a like affection of memory, and the feeling of fatigue after mild exertion so that elderly people tend to fall asleep by day—an indication of cell wasting—are the chief and certain signs of the oncoming of senility. Indeed, the picture of senility begins with these mild impairments, and they are the earliest functional derangements to be noticed.

Atrophy, which has long been noted, is the chief physical concomitant of age, and the keynote of advancing years, and is due ordinarily to vascular changes. The cortical neurones necessarily suffer with all the other cells of the body from arterial degeneration. A man was formerly said to be as old as his arteries, now he is sometimes said to be as old as his glands, which is questionable. In association with physical infirmity there is also a mental change, and the failing mental powers illustrate the law of dissolution, formulated by Hughlings Jackson, that the highest and latest acquired functions are the first to go. The most highly specialized attainments of the mind, such as abstract thought, are the most complex, the least organized and the least stable, and are, therefore, the first to be impaired in old age, and dissolution proceeds to dementia or the complete loss of mind power, when the mind becomes a blank and "sans everything".

## INSANITY AND OLD AGE

This leads to consideration of the question of insanity in old persons and to define, if possible, the boundary line between the physiological and pathological forms of senility, i.e. between the ordinary weakness of old age which is its natural termination and the senile dementia resulting from progressive decay and disease. Insanity does not spare old age. It occurs in old age as it occurs in adolescence and in full maturity. Apart from the inevitable modifications due to senile changes, the same forms of excitement (mania) and of depression (melancholia) are met with, and these two forms occurring in the affective sphere of the mind are mainly recoverable; others pass into senile dementia or the "insane dotage" and do not as a rule recover. These affective moods may alternate in the same person and after a period of moody taciturnity (melancholia) there follows one of childish hilarity (mania) ending in dementia. The chief difficulties and troubles with the excited form are the appearance, in the aged, of pathological sexual symptoms, and in the depressed form the tendency to suicide, a fact which Clouston greatly emphasized and noted in 80 per cent. of his cases. The progress towards senile dementia, following mania and melancholia, is marked by definite mental and moral deterioration. It is doubtful if there is any form of insanity characteristic of old age itself, that is, a mania or a melancholia or dementia occurring specifically in old age apart from the essential changes implied by senility. These forms may occur at any other period of life and they affect the aged as they do those of any other age.

In describing the difference between normal cerebral involution, which is a simple deterioration, and dementia, which is a termination, the former is the normal and general reduction of old age, with its difficulty in making new acquisitions, its defects of recent memory, such as remembering names, its narrowing of interests, its conservatism, its irritability, restlessness and fatigue, whilst dementia on the other hand (which occurs in 10 per cent. of all senile cases over seventy years of age) is manifested by marked failure of memory and intellect, by suspicion, especially about property, ways and means, and often a dislike to those near and who had been dear to them, by a readiness to yield to flattery and to be influenced by childish blandishments. Also their habits become faulty, and they show personal neglect, and they behave improperly to others. These are pathological signs and often lead to medico-legal treatment, which means detention in a mental hospital or in the care of nurses in a home.

It may be pointed out here that when a case passes beyond the normal decay of old age and property is involved even to less than £100 a year, an appeal to the Court of Chancery through the Master in Lunacy can be made, and upon the affidavit of the family doctor a Receiver can be appointed (and the cost is slight). The patient is thus unable to squander his estate, and protection is afforded to it and to its possessor. The patient can live anywhere thought best by himself, and the Receiver (who is, when possible, the next of kin and probable beneficiary). Failing this the patient can either be certified, or if volition exists be a voluntary boarder in a mental home. I have known wealthy senile patients who have come to be completely under the influence of plausible and designing nurses. Such patients have made their will in favour of their nurses and thus have deprived of their proper rights those who had natural claims of kinship and affection; passing over relatives who had always been regarded (even by the patient before his or her illness) as their lawful beneficiaries. Moreover, judges are averse from declaring a will to be invalid unless undue influence can be proved, which is very difficult. From imaginary prejudices against their relatives many old people have been persuaded to alter their wills in favour of presentable and scheming persons in attendance on them.

There is one form of dementia which occurs in young and old people, and which was first described and named after its discoverer, Alzheimer's disease, due to plates of arterial softening, and with motor and mental symptoms. Certain other forms of neuroses also complicate mental symptoms in the aged. Epilepsy may appear towards the termination of senile dementia, although there have been no previous fits recorded. Various forms of paralysis are common endings in senile cases, and due to cerebral hæmorrhage, high-blood pressure, thrombosis, new growths, embolism, and other forms of vascular diseases. There is one form first described by Marie as the "lacunar syndrome", due to multiple thrombosis and causing perivascular softening in the brain, and it is my belief that this complication is not infrequent.

### PROSTATIC CHANGES

Probably the most serious of the physical complications in the old age of the male sex is enlargement of the prostate. It is the most important and the most serious. It causes retention of urine with all the consequences of back pressure, urinary stagnation, uræmia, and septic infection. Whereas the normal bladder is emptied four or five times a day, in cases of prostatic enlargement, unsuccessful efforts to void the urine are made many times in the night and twice as often in the day. This difficulty causes sleeplessness, thirst, headache and renal insufficiency which is soon fatal. A surgeon should be summoned at once, as many old mental patients in their dotage are severe sufferers and yet unable to complain. Of all the afflictions complicating senility in men, this is the most helpless to secure relief.

### TREATMENT

The first line of treatment for any disease is to consider diet and to procure rest. After that the procedure is (1) preventive and (2) remedial. As age advances activity becomes lessened, and the rate of metabolism is slowed, and as in old age the patient is in his second childhood, food must be that for a child, and should be of a kind that is nutritious, easily digested and tempting or pleasing. Probably only a few useful teeth are left, and food must not be tough or hard. The nutrition of the patient is the first consideration, and the nearer the food of the aged is to that of the infant the more suitable and appropriate it is. Food for old people therefore must not be stimulating, and fruit should be an important ingredient. Milk, bread (or toast), fish, eggs, butter, salad, fruit and vegetables are the basic elements of the food on their menu.

Next to the question of diet comes the necessity for obeying the calls of Nature and observing regular habits. The chief necessity is to avoid constipation and to keep the bowels open. A taxol tablet or two, or cascara in the same dose and form, or failing this the liquid extract of the latter every night, should keep the body regular. Some prefer the mineral waters, such as Hunyadi Janos every morning. Once a week a blue pill (4 grains) or calomel (1 grain) taken at night and followed by a Seidlitz powder the following morning should be sufficient. Holloway, Beecham and Carter, who preached and practised regular habits, deserve a niche in the Temple of Æsculapius. Sleep must be procured and cold feet, often a cause of sleeplessness, may require a hot water-bottle and an extra eiderdown cover. The window is better left open and after a few nights, the freshness is felt to be agreeable. A cup of hot milk with Benger's, ovaltine, bournvita, Savory & Moore, Allen & Hanburys, or one of the many patent foods, will help to procure sleep. If not, a little bromide or chloral, or soneryl (1½ grains), or dial or medinal or veganin or aspirin will often help to secure rest. It is important for the aged to retire early as they wake up early, and ten o'clock is late enough to withdraw. Cleanliness is necessary above all else, and specially for the body, the teeth and the throat. Also, mild walking exercise by day must be taken. A garden is often a help where frequent short periods of exercise may be indulged in without being observed. Also it may be the only happy reminder of old associations; although the patient may not be a horticulturist. Links of association are often revived by a suggestive environment, as also by picture books.

It might be opportune to say that as senility has been attributed to a failure of some of the ductless glands, some practitioners have prescribed gland extracts, but (except in the case of the thyroid) with doubtful efficacy. Others, so as not to miss a chance, have used several glands in combination —such as the pluri-glandular extracts, but have been disappointed.

### CONCLUSION

Before concluding, I should like to add that music has been a soothing remedy for the aged, as it is with children. Also I would add a few remarks about the mental aspect from the preventive standpoint. A disturbed old age is often a legacy from the nervous diseases of childhood. The hygiene of the child's mind needs consideration if the nervous organization of the adult is to be sound and the failure to appreciate this may be the cause of much trouble and suffering in later life, which might be avoided. A high ideal of purity, not only physical but mental and moral, should be set before boys and girls so that they might come to be associated with high purpose, aspirations and ideals. The religious sentiment is one of the strongest emotions to control and inhibit self-indulgence in any form. This emotion will help to guide the young along well-regulated paths and help to ensure a happy, healthy and dignified old age.

I began this article by some remarks on self-culture in old age. May I conclude by stating that (speaking psychologically) no one is too young to commence the task of educating himself; no one is too old.

> " Nothing is too late
> Till the tired heart shall cease to palpitate.
> Cato learned Greek at eighty; Sophocles
> Wrote his grand 'Œdipus' and Simonides
> Bore on the prize of verse from his compeers
> Whom each had numbered more than fourscore years;
> And Theophrastus at fourscore and ten
> Had but begun his 'Characters of Men';
> Chaucer, at Woodstock with the nightingales,
> At sixty wrote the 'Canterbury Tales';
> Goethe, at Weimar, toiling in the Last,
> Completed 'Faust' when eighty years were past."

# THE MANAGEMENT OF DISORDERS OF THE NERVOUS SYSTEM IN OLD AGE

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THE commonest disorders of the nervous system met with in the aged are cerebral vascular accidents, the various forms of paraplegia, and, lastly, paralysis agitans. The treatment of these conditions will be considered in detail.

## TREATMENT OF AN APOPLECTIFORM SEIZURE

With an elderly patient who is in coma, it may be impossible at first to determine whether the condition is due to a hæmorrhage, or to a thrombosis. Should the blood pressure be normal and should the depth of coma lessen, instead of deepening, in the first few hours, then a thrombosis is more likely than a hæmorrhage. The patient, if not in bed, should be moved there. The head and shoulders should be kept raised by means of two pillows. Should mucus collect in the mouth the patient should be turned on one side. A quick examination will show the presence of a hemiplegia. The condition of the heart muscle must be determined and the blood pressure estimated. If the depth of coma be considerable, lumbar puncture should be performed. The presence of blood in the cerebrospinal fluid usually means that a large cerebral hæmorrhage has burst into the ventricles and death may be expected in a few hours. No further active treatment is called for in such a case. It must be remembered, however, that a spontaneous subarachnoid hæmorrhage from a leaking aneurysm, although rare after the age of sixty, does occur, and usually accounts for those cases in which recovery takes place even when blood is present in the cerebrospinal fluid. If the fluid is normal, a hæmorrhage is not, of course, excluded, as it may not have reached the ventricular system; from a practical point of view, however, the case should be treated as one of thrombosis.

There are two lines of treatment that may be called for. (1) If the blood pressure is normal, or low, the patient appearing collapsed and the heart sounds enfeebled, a stimulating line of treatment must be adopted. The patient should be kept warm by means of hot water-bottles and only one pillow should be used to support the head. The best stimulant for these cases is an injection of 2 c.cm. of coramine, which may be repeated four-hourly, if necessary. If this is not available, then strychnine and digitalis should be given. Oxygen and 5 per cent. carbon dioxide may be used if respiration is shallow.

(2) If the blood pressure is raised and there is cyanosis, then a liberal venesection of one or two pints is necessary. This may be carried out by cutting down on the vein, or by the use of a large bore venesection needle, connected with a suction bottle (French's apparatus). If, despite this measure, the blood pressure remains much raised, then 1 c.cm. of salyrgan may be given intravenously. This may have the effect of producing diaphoresis and diuresis, resulting in a fall in blood pressure. The use of this drug, however, is not without its dangers, especially in old persons with impaired renal function and should only be used as a last resort; it should never be given unless the blood pressure is high. Retention of urine is usual, and there should be no delay in the passage of a catheter; this should be repeated, if necessary, every six hours. When the more urgent part of the treatment has been carried out, the bowels should be opened by an enema; this should be repeated at the end of forty-eight hours. The giving of powerful purgatives by the mouth, even if the patient can swallow, is not advisable, If, after twenty-four hours, the patient is still in coma, a rectal enema of saline and glucose should be given. When the patient recovers consciousness, there may be a certain degree of restlessness and, unless contra-indicated, mild sedatives such as sodium bromide, 10 grains, and chloral hydrate, 5 grains, should be given two or three times in the twenty-four hours.

With regard to nurses, there should preferably, be two in the day-time, and one at night, in the case of private patients. They should be warned to refrain from feeding by the mouth until the patient is conscious and the swallowing reflex re-established; this may be tested by giving a small amount of water in a spoon and observing if this is swallowed properly. Fluids should be given for the first few days, and an adequate amount of glucose should be administered in the drinks. Thereafter, semi-solids may be given. Should the patient be unable to swallow, even though conscious, it is probable that bilateral thromboses have occurred and an examination of the reflexes will show evidence of a double hemiplegia. In such a case feeding should be carried out by a nasal catheter which can be left *in situ* and only changed occasionally. Care must be taken of the skin during the first few days; the position of the patient should be changed several times a day.

After the first few days attention should be paid to the paralysed limbs. Movements at each joint should be carried out by the nurse. Sandbags should be placed to prevent foot-drop; these should be replaced, as soon as convenient, by a light aluminium shoe, which should keep the foot up at right angles. The position of the arm should vary; it must not be allowed to be flexed at the elbow continuously as, when tone returns, it does so to a much greater extent in the flexors of the elbow than in the extensors. In the case of the hand, a light aluminium splint should support the wrist and keep the fingers in extension. Massage should begin after the first two weeks, provided the patient's general condition is satisfactory. As soon as the patient is able to co-operate, he should be encouraged to move the limbs, especially at the large joints, even although no movement ensues; any return of movement should be pointed out to the patient for his encouragement.

When aphasia complicates the picture, it adds considerably to the difficulties of the case from every point of view. At the first opportunity the patient should be reassured that some speech will return, as in the majority of cases this occurs.

With regard to medicinal treatment, after the initial stage is passed, this will depend on the blood pressure and the condition of the heart. If the blood pressure remains high, it is not always necessary to lower it. In cases in which previous blood-pressure figures are available, these should form a guide. Unless the blood pressure exceeds the patient's optimum figure, then vasodilators are to be avoided. In a nervous type of patient luminal in doses of ½ grain twice or thrice daily is excellent in allaying restlessness and anxiety. When, on the other hand, it seems likely that the blood pressure is abnormally high, vasodilators may be given. Tabellæ sodii nitritis co., one tablet once or twice daily, or some similar preparation, may be given. As previously stated, enemas are preferable to purgatives given by the mouth, during the first week or two, and thereafter one of the proprietary liquid paraffin preparations with phenophthalein or liquid cascara should suffice. A diet of approximately 1,500 calories a day with a protein intake of 80 grammes a day should be suitable for the average patient during convalescence. The fluid intake should be moderately restricted, and as a rule should not exceed 40 ounces. With regard to the period during which the patient should remain in bed, this naturally will depend on the rate of recovery. It is important that the patient should not remain in bed longer than is necessary. When recovery begins within two weeks, then the patient should be seated in a chair for increasingly long periods. When the general condition will not permit of this, the patient must be kept propped up in bed, in order to diminish the risk of a hypostatic pneumonia. It must not be forgotten that although cerebral arteriosclerosis accounts for the great majority of cases of "stroke", occurring in persons over the age of 60, occasionally it may be the first sign of general paralysis of the insane; this condition must be suspected if mental changes precede, or follow, a "stroke" in the absence of hypertension or definite arteriosclerosis.

### PARAPLEGIA

In elderly persons the usual causes of paraplegia may be divided into those that have arisen before, and after, the age of sixty.

*Paraplegia before the age of sixty.*—The usual causes are compression of the cord, subacute combined degeneration, and spinal syphilis. If the case has not been properly investigated, including a blood count, a Wassermann reaction and examination of the cerebrospinal fluid, then these measures should be carried out and the results, if positive, used in directing treatment. It should not be forgotten that compression of the cord may occur for the first time after the age of sixty, and its recognition, as a rule, is only possible by the application of Queckenstedt's test, and the examination of the protein content of the cerebrospinal fluid.

This test is carried out as follows. Lumbar puncture is performed with the patient in the prone position. The use of a special needle which can be connected with a manometer (Greenfield's needle) is advisable. By turning a cock on the needle the fluid is allowed to flow into the manometer, a reading is taken and an assistant then applies firm compression to the jugular veins in the neck. At once there is a quick rise in the column of fluid in the manometer and a rapid fall when the fingers are removed. When there is an obstruction to the free flow of fluid, for example, by a tumour compressing the cord, then the rise will be slight or absent; this constitutes a positive Queckenstedt's test. Should a manometer not be available, after lumbar puncture with the ordinary type of needle, jugular compression can be applied and its effect on the rate of flow of the fluid noted. In addition to this test, the cerebrospinal fluid must be examined, more particularly as to its protein content, which is almost invariably raised.

*Paraplegia arising after the age of sixty.*—Although the symptoms of subacute combined degeneration of the cord usually show themselves before this age, they may do so for the first time after the sixtieth year. The investigations referred to having been carried out, if the blood picture is suggestive of pernicious anæmia, then a fractional test-meal to establish the presence of achlorhydria may or may not be necessary to complete the diagnosis. The prognosis in this condition has improved greatly since the introduction of liver therapy. The importance of energetic and sustained treatment cannot be over-emphasized. For example, in an untreated case not less than 3 to 8 c.cm. of campolon or hepastab, or similar preparations, should be given intramuscularly each day for several weeks. Subsequently, the daily amount of liver should not fall below the equivalent of half a pound of liver extract, by the mouth, or an injection of 2 c.cm. of such a preparation as anahæmin weekly. In the treatment of this condition the value of re-educative exercises, especially in the ataxic type, must not be forgotten.

Paraplegia coming on rapidly or gradually associated with postural loss and ataxia, so that the picture may resemble one of subacute combined degeneration of the cord, may be due to arteriosclerosis of the spinal arteries. The symptoms arise as a result of a cutting down of the blood supply to the cord. If an important spinal artery be blocked, then the picture is one of an acute transverse myelitis, namely, a flaccid paraplegia with retention of urine.

Finally, there is another type of weakness of the legs which occurs in old persons, namely, a progressive stiffening of the legs, associated with some wasting and pain. The limbs become flexed at the knees. There is no sensory loss and no sphincter disturbance, points which help to distinguish the condition from a spinal cord disease. This picture is due to a fibrosis of muscles, which often feel hard to the touch.

*Treatment of paraplegia.*—Treatment should be directed to the following points : (1) Maintenance of the general health; (2) care of the skin; (3) prevention of bladder sepsis; (4) prevention of contractures.

With regard to the general health, there is a tendency, when dealing with a case of paraplegia, to conclude that because the patient is unable to walk, bed is the only alternative. Unless the patient is incontinent, he should be up in a chair during the day and in the fresh air as much as possible. The diet should be light and care should be taken to avoid articles of food which cause flatulence. Especially in bedridden cases does the question of the care of the skin arise. A water- or air-bed, or a rubber mattress, is necessary. Whenever possible, two nurses should be available during the day. The skin of the back must be kept scrupulously clean; spirit must be used to harden it, and a good dusting powder is essential. The position of the patient should be changed several times a day, in order to prevent pressure sores. The heels should be inserted in small rings which prevent them from actually touching the bed, or they may be padded. If a bed-sore develops, in the form of a black blister, the contents should be aspirated, but the skin should be left intact. If ulceration occurs the ulcer should be irrigated with hydrogen peroxide. A gauze dressing soaked in eusol should then be applied to the ulcer and changed at least once a day. A liberal supply of the following ointment should be applied to the skin immediately surrounding the ulcer, but not to the ulcer itself:—

| | |
|---|---|
| Olei ricini - - - - - - - | 240 minims |
| Unguentum zinci (B.P.1914) ad - - - | 1 oz. |

Strapping must not be used to keep the dressing in place. If this treatment is carried out three times a day regularly, the ulcer will heal in the majority of cases. Later when the ulcer is clean and healing, a dry antiseptic powder may be used.

Retention of urine, usually due to a vascular accident to the spinal cord, should be treated at once by catheterization. If the bladder is allowed to become distended, this lessens its chance of recovering tone, and increases the risk of sepsis. A catheter should be passed every six to eight hours, depending on the amount of urine excreted. Insufficient care is usually taken in passing a catheter. It must always be remembered that the meatus and first part of the urethra contain organisms capable of setting up a cystitis, and therefore they must be rendered as nearly sterile as possible before the catheter is passed. The hands must be scrubbed; the penis should be held between pieces of sterile cotton-wool, and the meatus carefully cleaned. With a glass syringe the anterior part of the urethra should be irrigated with a mild antiseptic such as 1 in 4,000 solution of oxycyanide of mercury. Only after these measures have been carried out should a catheter be passed. It should be of the soft rubber variety whenever possible. Twice during the twenty-four hours, after the bladder is emptied, it should be washed out with a solution of oxycyanide of mercury, which is allowed to run into the bladder. After three or four days, if retention is still present, the question of an indwelling catheter may be considered. Before deciding to adopt this method, it must be realized that urethritis usually results, which naturally increases the risk of a cystitis. On the other hand, as the catheter can remain in situ for three or four days at a time, it obviates the necessity of frequent catheterization.

Another advantage is that if there be any tendency to an associated incontinence, it prevents the discomfort and risk to the skin attendant on this. The catheter can be connected with a Dukes's apparatus, so that the bladder may be washed twice daily. Whether an indwelling catheter be adopted must depend on the circumstances of the case. If there is no difficulty in passing a soft catheter, then frequent catheterization should be continued; otherwise an indwelling catheter should be used. In order to lessen the risk of bladder infection, hexamine, 10 grains with acid sodium phosphate, or ammonium chloride, 20 grains, should be given three or four times daily. If cystitis develops, the reaction of the urine should be tested. If it is alkaline, and the patient has already been given the hexamine mixture, then ammonium mandelate with ammonium chloride may be tried in its place four times in the twenty-four hours, fluids being restricted to 30 oz. daily. It should be remembered that this treatment only suits a certain proportion of patients.

| | | |
|---|---|---|
| ℞ (*a*) | Mandelic acid - - - - - | 46 grains |
| | Ammonium bicarbonate - - - | 23 grains |
| | Liquid extract of liquorice - - - | 5 minims |
| | Spirit of chloroform - - - - | 7 minims |
| | Solution of saccharine - - - - | ⅛ grain |
| | Syrup of orange - - - - - | 90 minims |
| | Water to ½ oz. | |
| (*b*) | Sodium acid. phosphate - - - - | 20 grains |
| | Chloroform water to ½ oz. | |

Sig: 1 tablespoonful of each mixed together four times a day.

If the urine be acid, then a mixture containing potassium citrate 60 grains, and tincture of hyoscyamus 20 minims, should be given four-hourly, and the bladder washed out with a solution of sodium bicarbonate (60 grains to ½ pint of water). After three or four days, the hexamine, or ammonium mandelate mixture, should be given. Should a urethral stricture, or other cause, render catheterization difficult or impossible, a suprapubic cystotomy should be resorted to.

Retention of fæces should be combated by an aperient at night, such as a teaspoonful of liquid extract of cascara, or confection of senna, followed by an enema in the morning.

If the bladder is already infected, and the patient is incontinent, an indwelling catheter connected with a Dukes's apparatus, should be tried. This will lessen considerably the risk of bed-sores, and make the nursing of the case much lighter. Incontinence of fæces may be lessened by the withholding of laxatives, and the use of an oil or soap and water enema every other day. If abdominal flatulence is troublesome, the passing of a rectal tube may bring relief.

Involuntary flexor spasms, which consist of a sudden flexion of the legs, may be troublesome and painful. They may be brought on by the weight of the bed-clothes, and this may be obviated by the use of a large size bed-rest. If radiant heat is available, this may bring relief. A hot bath at night is often helpful. Luminal ½ grain with aspirin 5 grains, or 1 tablet of veganin, may allay the discomfort.

*Prevention of contractures.*—The main object of physiotherapy in an aged paraplegic should be to prevent the development of contractures, and to encourage the patient to perform voluntary movements. The limbs should be passively moved, not only by the masseuse during her daily visit, but by the nurse at other times. Massage to the legs, abdomen and back, should be given. There is a tendency in old persons to develop a paraplegia in flexion. Should the legs tend to adopt a permanently flexed position at the knees, despite efforts to the contrary, it may be necessary to put the legs on long splints for some hours during the day, and at night. Care should be taken to pad carefully at pressure points. Such a splint should have a foot-piece which must be at such an angle as to prevent the foot from dropping. In cases in which the long splint is unnecessary, a light aluminium shoe will suffice to prevent foot-drop and contracture of the tendo Achillis.

## PARALYSIS AGITANS

The cause of this condition is almost invariably a degenerative process of the cells of the basal ganglia, or of blood vessels supplying this part of the brain. There are no remedies that will stop its progress, but this may be slow, and although usually progressive, the condition may remain stationary. Tremor is usually the first sign of the disease. This symptom in many patients is a source of worry, because of the self-consciousness which is associated with it, and as a consequence they may feel disinclined to visit their friends. Reassurance that the tremor is much less noticeable than the patient imagines, and encouragement to follow their usual pursuits, often have a beneficial effect. Some patients, perhaps hearing the words "paralysis agitans," may fear a stroke; reassurance might be given on this point, as a hemiplegia is uncommon. In this type of early case, luminal ½ grain twice daily is often beneficial. As hypertonus becomes more marked, and with it slowing of movements, a trial must be made of the hyoscine group of drugs. The following mixture might be given :—

| | |
|---|---|
| ℞ Hyoscine hydrobromide - - - - | 1/150 grain |
| Sodium bromide - - - - - - | 8 grains |
| Aquam chloroform. ad ½ oz. t.d.s. | |

After a week, if necessary, the strength of the hyoscine may be increased to 1/100 grain. In place of hyoscine, stramonium in the form of the tincture may be given, beginning with 25 minims and increasing to 50 minims or more, thrice daily. It is unlikely that high atropine treatment (Hall) would be tolerated in old persons, but it might be worth a trial in selected cases. 0·5 mgm. of atropine daily, in the form of ½ per cent. solution of atropine sulphate, is given in two doses (one drop contains 0·25 mgm.). The dose is increased by two drops daily, so long as improvement takes place, until the optimum dose is ascertained. Because of the slowing of movement, there is a tendency for the patient to become dependent on others in dressing, and eating. This should be avoided as far as possible. The importance of using the limbs should be emphasized, and a good masseuse may be valuable at this stage.

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# RESPIRATORY DISEASES IN OLD AGE

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RESPIRATORY disorders are a common accompaniment of old age, and the lungs, like other organs, are subject to different morbid processes at the various age periods. Whereas in the young adult acute inflammatory disease brought on by virulent infection from without is chiefly seen, in elderly patients the clinical picture is more often one of recurrent and slowly progressive disability due to failure of the lower respiratory tract to clear itself of the ordinary bronchial secretion, with consequent stagnation and infection from within.

## CHRONIC BRONCHITIS

The majority of cases fall under the combined headings of chronic bronchitis and emphysema. The symptoms and signs presented by individuals in this group are so characteristic and uniform that it is tempting to forego detailed investigation, and to treat them all alike by palliative measures which can have little effect on the primary causes of their disease. A lively curiosity should be provoked by each case of chronic bronchitis, for the natural defences of the respiratory tract are elaborate, and it should be possible to find a specific reason for their breakdown. The defensive mechanism in the upper respiratory tract consists of an arrangement of the air passages in the nose, nasopharynx and glottis whereby the stream of inhaled air is deflected repeatedly, so that every part of it must come in contact with the sticky mucosa lining these passages, and the great majority of micro-organisms and other foreign particles are extracted, to be dealt with in the collections of lymphoid tissue with which the upper respiratory tract is abundantly equipped. Organisms escaping this filter will enter the trachea and bronchi, but should be engulfed there by the mucoid secretion which has some bactericidal action, but the main value of which is as a cleansing stream, continually flowing upwards from the smallest tubes into the pharynx, and carrying with it the engulfed organisms. The upward stream of mucus is maintained by ciliary action and by the forced draught which results from the rhythmic constriction of the smaller bronchi during expiration. In addition, the lining epithelium of the respiratory tract, like other mucous membranes, is highly vascular, and is capable of extruding many phagocytes at points of inflammation.

*Clinical features.*—A typical example of chronic bronchitis in an elderly subject will now be described. The patient may give a history of pneumonia in the distant past, perhaps even in childhood. Some time subsequent to this he had been troubled by cough and expectoration for a week or two whenever he had contracted a cold in the head. With advancing years these symptoms had persisted for longer periods, and had recurred on more trivial provocation, such as the onset of cold weather, or a change in the direction of the wind. Next the trouble had come on every autumn and persisted throughout the winter, and his capacity for work and enjoyment had been curtailed by shortness of breath on exertion. Ultimately indications of right-sided heart failure might have developed, with cyanosis of the ears and finger-tips, œdema of the feet and swelling of the liver. Before this stage was reached, his sufferings may have been accentuated by bouts of asthmatic wheezing, which would be provoked by cough or other exertion, or even by lying down in bed.

If such a patient be examined some years before the latter stage has been reached, his chest is found to be barrel-shaped, unduly deep from back to front. The shoulders and ribs are over-elevated, the intercostal spaces widened, the spine is kyphotic, and all thoracic movements are restricted. The area of cardiac dulness is diminished, rhonchi are scattered over both lungs, and râles can be heard at one or both bases. The constant occurrence of râles in a particular area of the lungs may be taken to indicate fibroid change, and is a common consequence of antecedent attacks of lobar or bronchopneumonia. The fixed barrel-chest is usually attributed to emphysema, a degenerative change which cannot be remedied by treatment. It is now known that this is not necessarily true, and that in a considerable proportion of the cases of so-called hypertrophic emphysema, the lungs are capable of normal function, but are not used efficiently because of faulty posture and loss of mobility in the walls of the thorax (Brooks *et al.*, 1934).

*Treatment.*—When the barrel-chest is mainly a postural defect provoked by recurrent attacks of bronchitis, with or without asthma, and when skiagrams of the chest show no gross disease of the lungs, great benefit may be obtained by remedial exercises designed to correct the faulty posture of the thorax, and to empty the continually over-inflated lungs. In other patients in whom the chest is not yet barrelled, but with persistent râles indicating fibrosis at one or both bases, exercises should be employed to increase the movement of the chest over the affected areas of lung. In both these types, the tendency to bronchitis is maintained by the diminished respiratory movements, which prevent the adequate upward stream of bronchial secretion. Stagnant secretion loses its bactericidal properties and in course of time becomes a culture medium in which pathogenic organisms will flourish. Attention must be directed to the nose, throat, accessory sinuses and mouth. No treatment will clear up bronchitis if reinfection is continued by organisms streaming down the air-passages from a septic mouth or a suppurating antrum. When these matters have received attention, treatment is continued on general lines. The stream of bronchial secretion is aided by the use of expectorants, five grains of potassium iodide or of ammonium carbonate in half an ounce of infusion of senega being given by the mouth three or four times a day. The use of belladonna and similar drugs which render the bronchial secretion scanty and viscid, is strongly deprecated. The thickened secretion is apt to obstruct the smaller tubes, producing alveolar collapse. I have seen a number of cases of broncho-pneumonia, and several of lung abscess, directly attributable to this cause. If the sputum be purulent, creosote inhalations should be given with the aid of a Burney Yeo inhaler. The inhaler is worn for one hour twice daily, eight minims of an equal mixture of creosote and spirits of ether being dropped on its central pad each half hour. The skin of the face must be protected with vaseline to prevent burns.

An equable climate, and the avoidance of irritating dust and fumes, are of great importance to bronchitics. Many of the wealthier sufferers have been in the habit of wintering on the French Riviera, and not a few have died there from acute exacerbations of their disease induced by the sudden changes of temperature which characterize that climate, or by superadded infections picked up in ill-ventilated hotels. Better resorts can be found on the south coast of England and on the Isle of Wight. For those who go further afield Madeira, Jamaica or Bermuda, may be advised.

### PNEUMONIA

Pneumonia in its three chief varieties, lobular, lobar and hypostatic, has a high incidence and a heavy mortality in the latter age-periods; indeed it has been called "the old man's friend," for it will remove him so swiftly and gently from this life. Whereas lobar pneumonia is usually due to infection with a virulent type of pneumococcus from some other individual, lobular or broncho-pneumonia is usually a complication of chronic bronchitis in the elderly subject, and hypostatic pneumonia results from prolonged immobility when a feeble patient is confined to bed with a debilitating illness or severe injury. Above the age of sixty, recovery from any of these varieties of pneumonia is rare. Lobar pneumonia having the shortest course, presents a less hopeless outlook than the other two. The treatment is similar for all three varieties, and consists of complete mental and physical rest, good ventilation and adequate nourishment. The patient should not be moved from his home or subjected to any other unnecessary fatigue. He should be nursed on a firm mattress with a porous rubber ring under the buttocks, to prevent pressure-sores. A wide and long bed-rest supports his back, from the sacrum to the top of the head, raising him to an angle of about 40 degrees with the mattress, a pillow being inserted in the small of the back to keep the abdominal wall extended and prevent cramping of the movements of the diaphragm. Blocks (or books) about 12 inches high are now inserted under the end of the bed at the patient's feet, so that the whole bed tilts downwards towards the head. This counteracts the thrust of the raised thorax and keeps the patient in a secure position of rest without any tendency to slip, and without the use of a knee-bolster. The windows are kept wide open, and curtains and other hangings removed. The patient is tended by trained nurses day and night, and relatives are not allowed to speak to him or to stay in the room for more than a few minutes at a time, unless they are unusually wise and co-operative. The nurses spare the patient all possible muscular exertion, wiping the sputum from his lips whenever he coughs, and plying him with fluids and easily-swallowed food whenever he is inclined to take them. Washing is almost confined to the hands and face, and the medical man must take full responsibility for any bed-sores which may develop. Over-conscientious washing and "attention to the back" have exhausted many a patient with pneumonia. The patient is encouraged to drink at least 3½ pints of fluid daily, including fruit juice with glucose, and milk in which raw eggs are beaten. He may have any light food which he will take, such as chocolate, ice-cream, oysters and jellies. An expectorant is given to prevent effort in raising the sputum, and at night an irritating cough may be relieved by a linctus consisting of syrup of Virginian prunes and syrup of codeine in equal parts, to be given in doses of two teaspoonfuls as often as required. If sleep is disturbed, 10 grains of Dover's powder may be given, and if necessary followed by 60 minims of paraldehyde. Should these drugs prove ineffective, and the patient is still restless, ¼ grain of morphine may be injected hypodermically, provided there be no cyanosis. Cyanosis indicates the need for oxygen, which may be given continuously through soft catheters passed through the nostrils. The gas is bubbled through water in a glass bottle, and from this led through a flexible tube to a Y junction attached to the patient's head or pillow and thence to the catheters. The passage of the gas through water raises the temperature of the oxygen and facilitates the regulation of its flow.

Oxygen tents are much advocated in the treatment of pneumonia. It is doubtful if the increased concentration of oxygen so obtained compensates for the loss of freely-circulating air. In many cases patients with pneumonia will not tolerate the presence of the tent and the feeling of being shut in a small enclosed space.

The use of alcohol in pneumonia has been much debated, and the current concensus of opinion is against it, except in known alcoholics who give indications of approaching delirium, and in the event of the patient exhibiting exceptional alarm and despondency, when he may benefit from the psychological effect. All unnecessary drugs, such as digitalis, are to be avoided, and anti-pneumococcal sera appear to have no demonstrable value in patients above middle-age (Davies *et al.* 1935).

### POST-OPERATIVE COMPLICATIONS

Elderly persons subjected to surgical operations, especially on the abdominal or pelvic organs, are notoriously subject to respiratory complications. Special care should be taken in preparation, and operation should not be undertaken during the winter months or at a time when there are any indications of catarrh in the upper respiratory tract or the bronchi, except in cases of extreme urgency. The mouth must be rendered as clean as possible, and grossly septic teeth should be extracted some weeks beforehand. The general condition must not be lowered by starvation and purgation, the bronchial secretion should not be dried up with atropine, nor the cough reflex depressed by morphine. Irritant inhalations such as ethyl chloride and ether should be avoided, also destructive poisons such as chloroform. A relatively safe combination will be found in nitrous oxide and oxygen inhalation reinforced by local or spinal anæsthesia.

After operation tight bandages must not be applied over the ribs or upper abdomen, and the patient must be encouraged to move and turn frequently in bed, from the first day. Possible complications are bronchitis, broncho-pneumonia, massive collapse, bronchiectasis, infarction and lung abscess.

### SENILE TUBERCULOSIS

Pulmonary tuberculosis is by no means uncommon in individuals above middle-age, and it is especially common in districts where work with glass, china, stone and iron involves exposure of employees to silica-dust. Tuberculosis of the lungs tends to develop more insidiously, and to give rise to less characteristic symptoms and signs in elderly than it does in young patients. The clinical picture may *simulate chronic* bronchitis and, unless the sputum be examined or the chest X-rayed, the condition may be overlooked until a very late stage or missed altogether. Often a case comes to light when an adolescent develops acute tuberculosis and a search of contacts leads to an investigation of the condition of the elderly relatives in the house. The disease usually takes the form of a slow infiltration through both lungs, with fibrosis and little or no cavitation. It is resistant to treatment, and collapse therapy is seldom applicable. The sanatorium regime does more harm than good, but I have sometimes seen good results follow the injection of gold salts. The same climatic conditions are desirable as in chronic bronchitis; but the main duty of medical men is to prevent the sufferer from infecting his younger and more susceptible fellows.

### MALIGNANT DISEASE

Malignant disease may be primary or secondary in the respiratory tract. Secondary deposits of a distant growth are often found on the surface of the lungs, and call for no special treatment except the repeated aspiration of the large blood-stained effusions which may add greatly to the patient's discomfort. Primary bronchial carcinoma has of late years been recognized as one of the commonest of malignant growths, and it is a curious feature that it is eight times more common in men than in women. As the growth enlarges, it causes bronchial obstruction with bronchiectasis or abscess formation, distressing cough, toxæmia and painful pleurisy. Excision is rarely possible, and in most cases treatment is not likely to prolong life materially. It is our duty however, to attack the growth by the local implantation of radon needles, or by deep X-ray radiation, for such treatment often shrinks the primary growth, with great relief of pain. Death from metastases follows, but is usually comparatively painless and merciful.

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# RHEUMATISM IN ADVANCING YEARS

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RHEUMATISM, in the aged is a term used to describe a number of conditions having little in common with rheumatic disease in the strict sense. The cardinal feature is stiffness of movement which may or may not be painful. The diagnosis is often made by the patient or his friends and being looked upon as a more or less inevitable accompaniment of advancing years, it may be ignored or treated by homely remedies until it has reached a stage at which little can be done or some other symptom makes it obvious that the diagnosis has been a mistaken one. It is important that increasing pain and stiffness in the aged or even in the middle years should be made the object of investigation as thorough and careful as at any other epoch, for much may then be done to relieve and probably to prevent the development of increasing disability or it may be to reveal some other pathological condition for which prompt treatment is desirable. Beadle states that the spine is the first part of the body to undergo the degenerative changes of age and in this respect it is not surpassed by the intima of the great arteries. These changes may be detected by the end of the fourth decade or even sooner and the first signs are designated rheumatic by the sufferer when he becomes aware of them, by which time they are generally well established.

The commonest forms are fibrositis and osteo-arthritis and in both the principal etiological factors are wear and tear, or it may be grosser injuries, together with deficient elimination and repair, attributable possibly to arteriosclerosis or what is vaguely termed tissue age. Heredity influences the age of onset to a considerable extent.

## CLINICAL TYPES

*Fibrositis.*—The periarticular form of fibrositis is commonly met with in those whose occupation necessitates exposure to cold and wet, the labourer who must work in the open in all kinds of weather or the charwoman whose hands are perpetually in and out of water, hot or cold, and who may also have to work in a steamy atmosphere relieved by draughts from door or window. To these conditions must be added the nature of the work which is often strenuous. The condition rarely takes an acute form but is gradual in onset and development, chronic in course and yielding but little to treatment when once established. Pain is aching in character, not constant or acute and affected to a marked degree by weather conditions frequently foretelling the onset of rain with as much accuracy as a barometer. Stiffness is subjective rather than objective and the limitation of movement is not great as a rule, but the fist is closed with difficulty and the arms may only be brought up as high as the head with an effort. The knees creak and rising from a chair is difficult, getting out of bed in the morning is a slow and painful business. Movement becomes easier with exercise, but fatigue quickly develops and the victim realizes he is getting old. The knuckles are enlarged from periarticular thickening but the articular cartilage is not affected till the later stages and then not to any great degree in the absence of gout or infective factors. In women especially at or soon after the menopause this form of fibrositis may appear as Heberden's nodes which gradually become ossified and constitute one form of osteo-arthritis, differing from others in the feature already mentioned, the articular cartilage is unaffected. These nodes appear at the bases of the terminal phalanges and are at the beginning cystic in character, filled with a gelatinous substance. At first the unsightly appearance and the dread which they give rise to of rheumatoid arthritis are alone of importance to the patient but as they become bony they are apt to be the site of aching pain.

Fibrositis of the back, shoulders, and gluteal regions, is also frequently the accompaniment of advancing years but may cast its shadows before in the late forties and this not only in the working classes. The golfer who begins to find himself unusually tired after his week-end on the links and stiff on the

Monday morning is suffering from an accumulation of muscular waste material which he has been unable to eliminate, possibly from the additional strain thrown upon his organs by the heavy meals demanded by a hearty appetite after his exercise and the by no means always innocuous beverages he has taken to quench his thirst or to fulfil the mistaken obligations of good fellowship. If he is wise enough to recognize cause and effect and to modify his habits accordingly no permanent harm will result, but otherwise fibrositis will gradually pass into fibrosis and he becomes old before his time.

The fibrositis of advancing years is due to the action of metabolic toxins such as uric acid and other products of disordered metabolism and tissue breakdown, and not to bacterial products as a rule. Accumulation of lactic acid, the product of muscular activity, may also act as an irritant; it is the cause of the stiffness which is the result of unaccustomed exercise in the young but in them is speedily disposed of by neutralization and excretion. In the later years these products are not so easily got rid of owing to the slowing of the circulation through the thickened arterioles and the clogging of the efferent tracks by the products of tissue waste as well as the fibrositic process itself.

Pathology.—The pathological process consists of a proliferation of the fibroblasts and a thickening of the coats of the smaller arterioles, an increase in the connective-tissue elements with gradual increase of density affecting the superficial aponeuroses, the intermuscular septa, the sheaths of nerves and the capsules of joints. Nodule formation is not conspicuous in the fibrositis of this degenerative type which is more generalized. The process tends to become a fibrosis, the characteristic of senescence.

*Osteo-arthritis* is perhaps more generally regarded as the rheumatic disease of old age, with it is usually associated some degree of fibrositis which may be the precursor of the arthritis as in the case of Heberden's nodes already described. Since osteo-arthritis is not due to infection and presents none of the characters of an inflammatory process it would be much better to adopt the French nomenclature and to speak of arthrosis.

Too often the appearance of small osteophytes is spoken of by radiographers as "arthritis" and much needless anxiety is caused to the patient who conjures up visions of a crippled and helpless old age. These minute bony outgrowths are the natural result of any severe or long-continued strain and are found at the point of attachment of muscles and ligaments. There were described by Sir Samuel Wilks in the vertebral column and he spoke of "labourer's spine," to emphasize their association with the strain of muscular activity; the fact that in the spine they are always most marked in the lumbar region on the left side in right-handed men and on the right in the dorsal region demonstrates the importance of this observation. Sir Arbuthnot Lane attached great importance to the influence of wear and tear in arthritis and described the effect of various occupations in producing exostoses which naturally become more marked with advancing years. As long as the intervertebral discs retain their normal size and elasticity there is not sufficient tension on the ligaments to lead to osteophytic formation but with the thinning of the discs which is natural with increasing age the buffer action is lessened and greater strain is thrown on the ligaments which tend to undergo ossification at their attachments to the bones. Such a process may almost be regarded as physiological. Ossification on a larger scale may, however, be met with around joints which have been the seat of definite pathological processes such as rheumatoid arthritis and gout. The object then appears to be to strengthen the bone which has undergone rarefaction and erosion as a result of the disease, and to give a better purchase to the ligaments and muscles, in fact to repair and buttress the weakened joint. In its most marked forms it is met with after the active disease has burnt itself out and is thus not usually seen till the later years. Menopausal arthritis if untreated tends to develop into osteoarthritis the first sign of which is the formation of small osteophytes at the edges of the patella, the articular surfaces of the femur or the tibia.

True osteo-arthritis begins as a degenerative process in the middle of the articular cartilage where pressure and friction is greatest, and not at the edges. It is most conspicuously seen in the hip-joint and was formerly described as "malum coxæ senile," a term which is now rarely used but which emphasizes its association with old age. In a skiagraph it is marked by a lessening of the joint space due to thinning of the cartilage, in its earliest stage, later the articular surface may become uneven, areas of osteoporosis are often to be seen in the underlying bone and osteophytes develop at the margins. In some cases the head of the femur is pushed upward and the acetabulum tends to become filled up with new bone from below, in such cases it is probable that there has been a congenitally shallow acetabulum, which has been a source of weakness and has conduced to abnormal strain on the articular structures.

The first sign is usually stiffness after exercise which improves with rest. It is not uncommon among hunting men owing to the abducted position of the thighs on horseback, gardeners who work in a squatting position very often also suffer and it has been suggested that in both cases it is due to compression of the ligamentum teres in this posture impeding the flow of blood in the artery which passes through the ligament and thus interfering with the nutrition of the cartilage. Limitation of movement increases, generally affecting abduction and adduction long before any loss of flexion or extension becomes noticeable, indeed so long as the sufferer keeps up walking exercise he will not have much restriction of the range of movement in this direction but if exercise is given up on account of pain and the days are spent in an armchair some loss of extension at the hip will soon occur.

Pain may be severe, it is worst when walking or standing, but the difficulty of getting the limb into a comfortable position in bed is often considerable and seriously interferes with rest; to place a pillow between the knees is often an effective way of overcoming this trouble. The pain in the early stages is commonly referred to the knee or inner side of the thigh through the obturator nerve, less often to the outer side and rarely in the actual distribution of the sciatic nerve although the pain is often spoken of as sciatica. It has been stated that crepitus is to be felt over the joint and this is diagnostic, but it must be rarely necessary to look for this to confirm the diagnosis and it is unlikely to be conspicuous.

Since wear and tear form such an important factor in causation it follows that osteo-arthritis affects chiefly those joints the function of which is weight-bearing; the spine, the hip, the knee, and the great toe. The shoulder is sometimes affected but generally secondarily to some definite injury or previous inflammation, the wrist invariably escapes, the terminal finger joints are affected before the proximal ones and the metacarpophalangeal joints also escape. These points are of importance in diagnosis between rheumatoid and osteo-arthritis, they do not apply to the secondary forms which occur as a late stage of gout or infective arthritis.

Osteo-arthritis of the spine is common, being probably present in the form of small osteophytes at the margin of the vertebral bodies in all men over fifty who have led laborious lives and may give rise to no symptoms beyond a moderate degree of stiffness but in some cases the osteophytes attain a large size and adjacent ones may fuse together though actual ankylosis of the vertebral bodies never occurs in this condition. Such fusion may cause considerable rigidity but this never affects more than a limited area. Sometimes, however, the joints between the articular processes are affected, the cartilage is gradually destroyed and considerable pain and disability are the result. When the fifth lumbar vertebra is affected troublesome sciatica is likely to result. The sacro-iliac joint tends to become obliterated in the later years but the small osteophytes often seen at the lower edge of this joint are of no importance and do not justify the diagnosis of sacro-iliac arthritis which is often based upon their presence.

Late in life a condition which is sometimes differentiated as senile osteo-arthritis may be met with. So far as the joints are concerned it presents no essential difference from the form already described but its characteristic feature is a general osteoporosis affecting the long bones and the vertebral column. As a rule there is no pain; stiffness wearing off with exercise is the chief symptom.

*Senile kyphosis.*—Although some degree of kyphosis is not unusual in osteo-arthritis of the spine, there is a well-defined form which affects the upper dorsal region. It is due to degeneration and atrophy of the discs at the anterior margin which allows the edges of the vertebral bodies to come in contact, and ankylosis sometimes follows, the bodies become wedge-shaped and the kyphosis cannot be straightened out. Occupation or habitual stooping will conduce to this result. It may be distinguished from adolescent kyphosis by the fact that the latter always affects the middle or lower part of the dorsal spine and never the upper.

### DIAGNOSIS

Chronic gout or infective arthritis beginning in late life as occasionally happens may be confused with osteo-arthritis. In gout the presence of tophi, the history of acute attacks, and a raised level of the blood uric acid will serve to distinguish the condition. Infective arthritis never begins in the terminal finger joints but osteo-arthritis affects them before attacking the mid-phalangeal joints; the carpus is never affected by primary osteo-arthritis but is one of the most frequently affected in rheumatoid arthritis. The swelling of the joints in rheumatoid occurring late in life is usually soft and puffy and the joints are often unusually mobile, muscular atrophy is more marked than would be the case in other forms. Osteo-arthritis of the hip or spine may readily be confused with Paget's disease or with carcinomatosis due to a primary focus which has not given rise to symptoms, frequently this is in the prostate. X-ray examination should clear up any doubt and may be supplemented by estimation of the blood phosphatase and the calcium metabolism.

### TREATMENT

The various rheumatic conditions which are met with in advancing years call for the same general principles of treatment. To cure may be out of the question but the process may be slowed in its rate of progress and symptoms relieved. Steps must be taken to reduce wear and tear and to obviate all avoidable causes of strain, careful examination and close inquiry may be necessary to detect some of these. Diet calls for regulation, the most frequent error being excess in quantity rather than kind. A general but reasonable restriction is called for; in fibrositis carbohydrate excess should be guarded against and also when the patient is overweight. People over fifty will generally do well to reduce the amount of meat they eat and to pay special attention to its digestibility; it does not matter whether the colour is red or white provided the meat is tender, but generally chicken and lamb are more easy of digestion than beef. An ample supply of green vegetables and fruit should be taken, and this will help to regulate the bowels, a matter of considerable importance, for the aged frequently tend to become constipated and to take laxatives especially salines of various kinds imagining that by these measures they will cure their rheumatic ailments, an idea which is sedulously fostered by the vendor of patent medicines. The result rarely justifies the belief.

It is important to see that sufficient fluid is taken and, since frequency of micturition at night is often a trouble, fluids are best taken early in the day; one or two glasses of water, hot or cold, or weak tea may be drunk before breakfast with advantage and repeated in the forenoon. Lemon juice or lime juice suitably diluted are also useful beverages. By these means the renal functions will be promoted and elimination stimulated. Milk and milky foods should be encouraged if there is no overweight. Some patients show evidence of hypothyroidism and in such cases a small regular dose of thyroid will be beneficial.

Clothing often calls for regulation, it should not be heavy but sufficiently warm; a frequent fault is to wear an excessive amount indoors owing to the faulty circulation; a wrap that can readily be thrown off is better than heavy and impervious woollen underclothing. This is not to say that woollens are not desirable in reason.

In osteo-arthritis of the hip a walking calliper splint is often helpful. By taking the weight of the body off the hip-joint the process of wear and tear is checked and pain is also relieved.

Surgical interference in this condition in the aged should be avoided when possible because of the shock it causes, but it may be necessary when the pain is severe.

Local and general application of heat by means of electric lamps or infra-red rays often give relief and may be followed by massage in cases of fibrositis. In osteo-arthritis, however, massage is less often of service except for the treatment of the associated fibrositis. Diathermy frequently relieves the pain in osteo-arthritis of the hip but presents no advantage over other modes of applying heat in more superficial joints.

A visit to a suitable spa once or twice a year is a form of treatment that many patients find valuable. The methods of treatment do not call for special description, and are necessarily varied to suit different conditions but improvement of elimination is always an important feature.

Of the various drugs that are used few need be mentioned, aspirin is of great value for the relief of pain and stiffness and may be given with impunity provided it does not cause gastric disturbance. Cinchophen appears to be more useful in some cases but the risks attending its use render it generally undesirable in such chronic conditions. Iodine is given in various forms of which the tincture or a simple solution in rectified spirit is one of the most useful and should be given in milk; there are various organic forms which are useful and often better tolerated. Sulphur has always had a considerable vogue but on empirical grounds and there is no definite evidence of its value. It was formerly popular in conjunction with guaiacum resin as the "Chelsea pensioner." It is possible that the value of sulphur lies in its laxative action for careful regulation of the bowels is of great importance in these senile conditions.

Vaccines, protein shock, and gold are all unsuitable for the treatment of rheumatism of the kinds under consideration.

Externally the use of the various preparations of methyl salicylate with light rubbing will be found helpful in fibrositis, while iodine in such forms as the ung. iodi denigrescens may be tried in osteo-arthritis.

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# THE SURGERY OF OLD AGE

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THE birth-rate is steadily declining, and the expectation of life equally steadily increasing. Statisticians assert, therefore, that in due course Great Britain will become a nation of old men, and the prospect is not one that can be contemplated with equanimity. To some extent, however, the situation appears to be inevitable, since there is no method of suddenly restoring the balance between age and youth, the process of decline having been in operation already for many years. The facts must therefore be accepted, and the least that can be done is to examine the methods by which the physical well-being of the older generation of the populace may be safeguarded, so that they may constitute the least possible burden upon their younger supporters. Surgery has an important contribution to make to this question, particularly since euthanasia has failed to commend itself to the nation's legislators.

It cannot be for a moment maintained that there is such a thing as a department of surgery appertaining to old age, and no specialty of "gerontology" or "geriatrics" has yet found its exponents. It may be of service, however, to examine some of the familiar problems from the point of view of the old person, to see whether any modification of surgical practice may be needed from that angle.

"Old age" is an exceedingly relative term. A man is as old as his tissues, and while one may be aged at fifty, another may be young at sixty-five. One elderly patient may therefore be safely subjected to far more surgical disturbance than another, and judgment of the capacity of the individual must enter largely into all surgical decisions. The surgeon must therefore be willing to be guided to some extent by the advice of the physician or practitioner who is more familiar than himself with the patient's history and capabilities. Advancing years bring with them an increase in some of the risks attending surgical operations, though there are none that are peculiar to old age. Thus there is an increased liability to vascular catastrophes such as phlebitis and pulmonary embolism. This is associated with vascular degeneration and slowing of the circulation, perhaps also with low blood-pressure and a greater tendency to immobility in an old person who has been subjected to the shock of an operation.

## ANÆSTHESIA IN OLD AGE

The greatest risk of all, however, is that of pulmonary complications—bronchitis and broncho-pneumonia—and this introduces one of the most important considerations of all, the question of the anæsthetic. It is an axiom of surgery that operations are the safer and the less distressing to the patient, the better the anæsthesia. In old age this is of supreme importance, and almost takes first place in assessing the risks. The bronchitic tendency, already mentioned, suggests that ether should be almost entirely eliminated. Chloroform is unsuitable owing to the dangers of its depressant effect on an elderly myocardium. Spinal anæsthesia is usually unsuitable, since an old patient will so often have a blood pressure that is either too high or too low for safety with intrathecal drugs. There remains gas-and-oxygen anæsthesia, with or without rectal avertin, and local analgesia with novocain or percaine. It is these methods which should be used for old people almost to the exclusion of all other forms of anæsthesia, and it will be found in practice that gas-and-oxygen given with reasonable skill and combined with suitable pre-operative medication will be satisfactory for most old patients, even for abdominal operations. The value of local analgesia is insufficiently appreciated, especially in the performance of the emergency operations of old age. A cæcostomy for obstruction of the colon by a ring carcinoma, gastrostomy for carcinoma of the œsophagus, suprapubic drainage of the bladder for acute retention of urine, and most of all, the relief of any form of strangulated hernia, are all easily performed with local analgesia. An old patient with a strangulated hernia is already ill enough from shock and toxæmia, so that any general anæsthetic is often the last straw. Local infiltration with novocain, however, adds nothing to the strain on the patient, and also enables the operation to be done carefully and without hurry. Many a time a strangulated Richter's hernia has been hurriedly relieved under general anæsthesia by cutting Gimbernat's ligament without any attempt being made to cure the hernia permanently, on the grounds that speed is essential. This is true enough when the only available anæsthetic is open ether, and it may then be necessary to condemn the patient both to the risks of pulmonary troubles and to a certain recurrence of the hernia with all its attendant distresses. With novocain, on the other hand, the operation may be performed with due deliberation, and a permanent cure obtained with as much precision as if it were being done under the best conditions. The same principles may be applied to the treatment of uncomplicated hernia in old people. On innumerable occasions patients have been refused the benefits of surgery for the cure of an uncontrollable inguinal hernia on the ground that they were too old for operation. The idea which determines this refusal is partly fear of the results of an ether anæsthesia, and partly the belief that the tissues of old people do not heal so well as those of younger people. The anæsthesia difficulty may be largely eliminated, however, by a fuller appreciation of the uses of local analgesia as already explained. The healing difficulty may be, probably is, a real one, but modern methods of operating, particularly that which makes use of a small strip of the external oblique aponeurosis as suture material, can eliminate this trouble also. A living suture is incorporated so quickly and securely in the tissues that even an old patient may be allowed to move freely from the start, and may be allowed to get up a week after the operation if pulmonary trouble seems to be threatening with more prolonged recumbency. A truss may be a source of constant misery to an old person unless the hernia happens to be small and easily controlled by a light instrument. Partial control may cause severe pain and may be even worse than abandonment of all attempts at control, but the necessary result may be serious curtailment of the patient's activities. Unfortunately advancing years seem often to impair the individual's willingness to undergo the supposed risks of any operation. Caution becomes exaggerated at the period of life when the value of that life to the community is least. It is for surgical technique to inspire confidence by its increasing safety and success, so that some of the commoner disabilities of old age, as hernia undoubtedly is, may be more often treated.

The treatment of hernia is a particularly good field for the extension of the benefits of surgery among the old because, with the aid of suitable anæsthetics, it may be made into a comparatively trivial affair. In the absence of strangulation, however, it is not an operation of necessity, and so tends to be indefinitely postponed for a variety of reasons. Many operations of necessity, on the other hand, are of their nature much more serious, and therefore are a greater tax on the vitality of the patient, and on the surgeon's ingenuity and forethought in adapting his methods to the patient's circumstances. There are few surgeons nowadays who do not regard removal of the gall-bladder as the correct treatment for gall-stones in ordinary circumstances. The operation, however, is severe, and it may be much wiser in dealing with old patients to return to the old-fashioned procedure of removal of the gall-stones and drainage of the gall-bladder, an operation which is usually easy and quickly performed. A pedantic insistence on the theoretically best operation is the mark of unbalanced surgery.

### CANCER

Cancer is to a large extent a disease of old age, and therefore demands special consideration. Although some of the factors determining the incidence of cancer are obscure, one of them at any rate is plain, namely the time factor. A given source of irritation may produce a cancer in a relatively short time in one individual, but for one such there are many in whom the time factor must be greatly prolonged before the same result is produced. It is for this reason that cancer is, on the whole, a disease of old age, and it is believed that the rising mortality from cancer is partly to be attributed to the fact that more and more people live to reach the "cancer age." But although cancer claims increasing numbers of victims, surgery is at the same time slowly improving its methods of attack, though apparently too slowly to keep pace with the rising incidence. Early diagnosis remains the chief road to success at all ages, though in old age this is not so paramount as in younger people. The "cancer age" begins after forty-five years, and extends for the next twenty years at least. Thereafter the incidence declines, until in the eighth decade it becomes relatively infrequent. For a large part of the cancer period, therefore, the consideration of old-age surgery does not apply, and when it does begin to demand attention it is interesting to find that even early diagnosis has become of less importance. The lessened vitality of the cell in old age seems also to be a property of the cancer arising in the aged, though this is usually expressed (perhaps quite inaccurately) by saying that the old person has a greater resistance to the disease. This has an important bearing on the surgical attitude, since, coincidently with a decreased capacity for withstanding surgical shock, there is, on the whole, a decreased necessity for the more drastic surgical treatment. This may be illustrated particularly well by reference to carcinoma of the breast. It is a well-known fact that this disease grows less rapidly and is disseminated later the older the patient. The tumour tends to produce a more effective tissue reaction in the shape of fibrous tissue, and so the characteristic "scirrhous cancer" of old people is produced. This form of cancer is quite sufficiently malignant, but in very old people either the fibrous tissue tends to delay dissemination, or the disseminated cells fail to obtain a foothold in the tissue and are destroyed. The consequence is that it may be justifiable to adopt an entirely different surgical attitude in dealing with very old people. Thus in some it may be plain from the long history and the atrophic characters of the tumour that the patient is almost certain to die of intercurrent disease before any serious symptoms are likely to result from the slowly-growing cancer. Complete inaction may then be the correct surgical attitude. Or again, conservative treatment may be fully justified, such as a local excision of the tumour with diathermy, an operation which may be performed without risk in most old people owing to absence of surgical shock. The operation may even be done under local analgesia with complete success. The combination of conservative surgery with irradiation, either by interstitial radium needles or deep X-ray therapy, is another method of circumventing the danger to an old person introduced by attempting a radical operation. Experience has shown that this method of treatment is justified by its success at any age, and is therefore the more suitable for use when drastic surgery is inadvisable.

Carcinoma of the tongue, lip, floor of mouth, fauces and extrinsic carcinoma of the larynx are all diseases of old age. The primary growth in all these conditions need never be an indication for any operation more severe than a biopsy. The treatment can be carried out by means of interstitial radium, the radium "bomb," or deep X-ray therapy. It must be admitted that all these forms of treatment are severe though, as there is no surgical shock entailed, old people can usually endure them without serious risk. Treatment of the lymphatic areas in the neck is more debatable. The usual view has been that block dissection of the neck is absolutely necessary. This is, however, much too severe an operation for most old people, and I have obtained excellent results by means of interstitial needles in the neck with patients in whom the primary growth has been treated by this method. The treatment is unpleasant while it lasts, but has no mortality in spite of being very drastic. If the primary lesion is treated with the radium bomb, then the neck will be dealt with at the same time. Occasionally it may perhaps be justifiable to leave the lymphatic areas untreated if the patient's expectation of life is in any event short, though this decision will almost certainly lead to lymphatic recurrence and much pain if the patient falsifies the forecast.

Treatment of carcinoma of the vulva or of the cervix will always be carried out by irradiation, so that the patient's age will not be an important consideration. The various forms of abdominal carcinoma on the other hand cannot be treated by any method except operation, and here certain risks cannot be avoided. Carcinoma of the stomach is almost uniformly fatal in younger patients, and it is only in old patients that its malignancy may be low enough to give any hope of success.

Thus the best result I have yet obtained was in removing an enormous carcinoma of the pyloric half of the stomach from a woman who appeared to be 70 years old. She suffered severely from chronic bronchitis, and the operation was done entirely under local analgesia. The patient is quite well except for her bronchitis, over five years later.

Many abdominal operations can in fact be performed without seriously shocking even elderly people if enough care be taken in preparation of the patient and choice of anæsthetic. This applies especially to operations on the large intestine and pelvic organs. Removal of a carcinoma can usually be carried out successfully at any age if it be preceded by thorough drainage of the intestine at the first operation, so that the gut is in good condition and no strain is put upon the site of anastomosis. Paul's operation may also be a useful method of reducing shock and risk of distension or leakage after operation.

The position with regard to cancer may therefore be summarized by saying that, given reasonably early diagnosis, the treatment of the disease in accessible positions in the aged is on the whole satisfactory, and undoubtedly better than in younger people.

### PROSTATIC ENLARGEMENT

Another common disease of old age is enlargement of the prostate, but here, as regards the results in middle and old age, these are much better in the younger patients. The reasons for this are obvious, since the operation of suprapubic prostatectomy is necessarily a severe one and the post-operative period is beset by serious complications, chiefly due to sepsis. The younger patient here profits to the full by his greater capacity for enduring shock and loss of blood, by his greater resistance to infection, and by his having less liability to poor renal function owing to arteriosclerosis and chronic nephritis. There are a number of recorded examples of successful prostatectomies having been performed on patients of ninety and upwards. These successes, however, are the exception, and in treating the older patient the bias should be towards conservative measures whenever possible. In some patients the prostatic obstruction is spasmodic rather than permanent, and the old-fashioned treatment of tying in a catheter while the urine is made alkaline still has its use in tiding a patient over the crisis. In the hands of an expert transurethral prostatectomy is safer than the more drastic operation, and high claims are made for the results of ligature of the vasa efferentia on both sides according to the method of Steinach. The operation is comparatively trivial and can be performed under local anæsthesia, so that it will clearly have an important place in treatment if time proves that the claims are justified. It is difficult to find a rational basis for the procedure, so that scepticism would seem to be healthy for the present.

### THE THYROID IN OLD AGE

A fruitful field of surgery among old patients has been opened up in recent years as a result of a fuller understanding of the disorders of the thyroid gland. There is nothing new in operating on large goitres in old people with pressure symptoms. The newer developments have resulted from a recognition of the results of the milder degrees of toxic goitre. It now begins to be plain that the medical "cure" of toxic goitre is usually incomplete, and that alleviation of the more acute symptoms may be a source of danger in the long run. The patient may be so much improved that both she and her medical attendant are willing to believe that a good result has been obtained. Nevertheless enough thyroid intoxication usually persists to keep the heart in constant overaction, and in the course of years it becomes insidiously damaged. Ultimately in later life the heart begins to fail or develops auricular fibrillation, and it might be supposed that surgery was by that time inapplicable. It has been found, however, that even old people with these serious symptoms are still capable of a remarkable degree of recovery when a partial thyroidectomy has been performed. The same cardiac condition is found to occur with increasing frequency among old patients with long-standing nodular goitres, the toxic effect of which had never been noticed by anyone. Cardiologists now begin to recognize that nodular goitre is, in later life, one of the commonest causes of auricular fibrillation, and so surgical interference is now found to be necessary where formerly the true source of the cardiac trouble had not been suspected. It might seem at first sight that elderly people in this state were eminently unsuitable for operation owing to the risk of interference. The reverse, however, has been found to be true. A properly-planned operation undertaken after careful preparation of the patient, and done under avertin narcosis reinforced by gas-and-oxygen is remarkably safe. The operative mortality has indeed in some clinics been reduced almost to nil, even when the patients include a high proportion of elderly fibrillators.

### FRACTURES

The brittle bones of old age introduce a certain liability to fractures, though the only one that is specially feared is fracture of the neck of the femur. The prolonged recumbency that was formerly necessary in treating this injury resulted in a high death-rate, and the results in those patients that survived were not good. This is being changed by the use of the Smith Petersen pin by which immediate fixation of the fragments in a good position is obtained. Active movements can be begun immediately after the operation, and the patient can be allowed to sit up and turn in bed, so that pulmonary complications can be avoided. The method is so satisfactory in expert hands that Watson Jones at Liverpool has been able to obtain a successful result in 91 per cent. of his patients.

It can be seen therefore that surgery in old patients is gradually robbed of its terrors, and that its scope is likely to increase with the passage of time.

# DIET IN OLD AGE

By HUGH DUNLOP, M.D., M.Sc., M.R.C.P.

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TO the physiologist diet means the food ingested. The term therefore covers, not only the spartan regime dear to contemplation albeit hateful to practice, but also everyday meals. Age is computed in years but the age which may be said to be old is a contentious matter. Pigment and the arts of dentist, oculist, and beauty surgeon may mask or accentuate the appearance of age. And apart from these, constitution, circumstance, and hygiene play their part. That one man is older at fifty than another at seventy is a commonplace truth which must be taken into account in the management of the aged: if they desire to or can be managed.

Nevertheless, even in the most independent, age makes itself felt and may be held to include the last two stages described by Shakespeare. Not all the old contemporaries are lean and slippered pantaloons but their metabolic needs are less than in the full exuberance of youth. Presbyopia and a reduced metabolism are two of the characteristics of age. The "last scene of all, that ends this strange eventful history" is described in the present symposium by another author and it is proposed to discuss only the sixth stage.

## THE ENERGY METABOLISM OF OLD PEOPLE

*The energy requirements* of age are less than those of vigorous maturity for two reasons, (1) the basal metabolic rate is less, and (2) exercise and labour are less.

(1) The basal metabolic rate is remarkably constant per square metre of body surface per hour, between the ages of twenty and forty. Thereafter it shows a slow progressive decline. The activity of the tissues even at metabolic rest is slowing down, prior to final extinction. The basal metabolic rate of a man between the ages of twenty and forty averages 37·7 calories per square metre per hour. At eighty years the figure has fallen to 33·7, a decrease of roughly 10 per cent. This may seem a small decrease, but it must be remembered

that it is a fall of capital value and one which cannot be regained. With it go a decreased sense of vitality and diminished capacity for work. If the basis is contracted the superstructure must also be narrowed.

(2) The muscular work of age is less than that of youth and middle age. This is quantitatively more important than the decrease of basal metabolism referred to above, but the two are intimately related as already explained. The two together render the aged tissues inelastic to metabolic strain.

## THE COMPOSITION OF THE DIET

The proportions of protein, fat, and carbohydrate will not be specially considered except in special cases. Vitamins are needed in moderation. On theoretical grounds excess of vitamin D would be harmful as promoting calcification. Vitamin B should be liberally given when constipation and other alimentary symptoms are prominent. Nor must the vitamin C content of the diet be neglected. I have recently seen scurvy in an old lady living alone. The amount of salt may be left to the taste of the individual in most cases but should be restricted when œdema or obesity is present. A moderate increase of salt is indicated in the hot weather when salt is lost by sweating and then Ringer's solution is a better beverage than plain water.

As a general rule a liberal intake of water is advisable. This need not equal the three quarts said to be recommended by the late J. D. Rockefeller. The volume should be approximately four pints, but weight and climate modify the amount required. Water should be taken after, rather than during, a meal. The usually given advice to sip fluids should be avoided as this leads to ærophagy. Nor should they be swallowed in Homeric draughts.

## PRACTICAL CONSIDERATIONS

Science teaches us what we knew before, that old people should be moderate in their eating. How are they to achieve moderation? Some will achieve it spontaneously, others will need advice. A weighed diet is as a rule unnecessary. A diet sheet is usually unnecessary but should be supplied if desired. Definite advice should be given as to the number of meals per diem. Four, better three, is the maximum and one of these should be very small. The Russian writer, Gogol, has given a picture of the metabolic economy of two old people who all day long urged each other to eat. They truly dug their graves with their teeth. Children and hosts of the elderly should also avoid this example. Above all, the old should not be urged to liberal feeding.

The meal should be discontinued, not at the point of distention nor at the end of satisfaction, but rather when hunger has been blunted. Besides the baneful effect of excessive stoking on elderly metabolism, the accumulation of fat is to be deprecated. To quote Hutchison and Mottram, leanness and longevity go together—as Shakespeare knew—although there are exceptions to this rule. As these dietitians say, excess of fuel chokes, not feeds, the flickering flames. It is tempting to think of accumulation of fat round the myocardium, but obesity is a mystery and even the thin old man cannot overeat with impunity.

In certain pathological cases, in which the appetite is excessive, the doctor is faced with an ethical difficulty. For example, arteriosclerotic disease of the brain may, by destroying the inhibitions acquired in adult life, release the nutritional instinct so manifest at the age of ten. Is the physician to imprison the appetite in walls of hunger? Or is he to make the old man happy? I think the latter.

Apart from these pathological instances, it must be realized that a large meal is in itself harmful. Not only may it set up abdominal pain or disturb sleep, but in some way it affects—perhaps through the vagus—the action of the heart. It is common knowledge that an anginal attack is specially prone to develop after exertion on a full stomach.

Rest after meals is indicated in old age and when possible friendly conversation during them.

Should marked anorexia be present the occasional use of the bitters, e.g. gentian, before meals, is permissible.

Certain indigestible articles of diet should be avoided, such as new bread, fried potatoes, and tough meat. If constipation is present, it is better controlled by a mild aperient than by taking a large excess of cellulose, should the latter cause discomfort.

Condiments, except in moderation, and strong tea and strong coffee should generally be condemned. In certain cases of dyspepsia condiments seem to do good. The food should be easy to masticate.

## ALCOHOL

The use of alcohol in age, as in youth, is the subject of controversy. In the thinking of some authors alcohol has to be fought with religious fervour, others regard it as a balm and a blessing. Bacchus has been variously regarded as a god or a demon. Nevertheless, the experience of mankind throughout the ages has on the whole favoured the use of alcohol in moderation.

Alcohol has a limited food value as well as a potent drug action. An average individual can oxidize about 10 c.cm. per hour. The food value of alcohol is a justifiable indication for its use only in illness. Even then glucose would be more effective, although in many cases less pleasurable. As a drug alcohol is a reflex stimulant, acting on the nerve endings in the upper alimentary canal, and is also a carminative. These actions coupled with the psychological effects render it suitable for occasional use to assuage the feelings of exhaustion which often disturb the aged. Alcohol is not a true cerebral stimulant; the whole body of scientific evidence shows that the action is that of an anæsthetic and that such apparent evidences of central excitation as occur are due to release of lower levels by weakening of the higher control. When the higher controlling centres are already grossly weakened, as in arteriopathic and senile dementia, the use of alcohol is contraindicated as it often produces mental confusion.

Alcohol like other anæsthetics has a hypnotic action and this is perhaps its most valuable property so far as the old man is concerned. In many cases of insomnia the occasional administration of a hypnotic is preferable, but in others a small dose of alcohol at night has a sufficient sedative effect.

The weight of scientific evidence is on the whole against the old idea that withdrawal of alcohol from those long accustomed to it is harmful. Nevertheless, many physicians have formed the impression that sometimes withdrawal symptoms may occur. It is certainly true that the prohibition of alcohol to an old man long accustomed to moderate doses is in most cases inadvisable. It may be that the prop struck away is a psychological one, but it is best not to remove it. There is no proof that alcohol protects against infection. Heavy drinkers who escape an early death are probably examples of the survival of the fittest. It would seem that alcohol in small doses should not be withheld from the aged, if it proves a comfort to them.

There remains to be decided the form in which the spirit is to be enclosed. The most suitable preparation is whisky. Not more than two small doses well diluted should be taken in the twenty-four hours and preferably only one—at bedtime. The whisky should be diluted; to those able to take only neat whisky, water should be taken immediately after the spirit is swallowed. When faintness requires relief, brandy is advisable.

### SMOKING

Often as age advances there is a diminished tolerance to tobacco smoke. Should untoward results accrue, such as premature contractions, or "tobacco angina," smoking should be diminished or discontinued. According to Stoddart, the use of tobacco should be prohibited to cases of senile dementia in which smoking often causes mental confusion. In any case smoking is a rite which is most suitably performed on a full stomach, not on an empty one, and care should be taken that in lighting his pipe the old gentleman does not ignite his clothing.

### DIETETIC PRINCIPLES IN DISEASE

(1) In cases of senile tuberculosis the calorific value of the diet should be increased. This is also true in elderly diabetics who have tuberculosis, the increased diet being balanced by insulin. If the patient is kept in bed the diet should be above basal level. The protein should not be restricted. Digestibility is a primary consideration. There is no need to overfeed.

(2) A diet of low calorific value is indicated for obesity, heart failure, chronic bronchitis and arteriosclerosis. Normal quantities of protein of good biological value—gelatine, for

example, would be unsuitable—are, however, needed. So also are fresh fruit and moderate quantities of milk to supply vitamins.

In azotæmic renal disease prolonged restriction of protein is inadvisable and not only fails to control the uræmia but also leads to wastage of tissue protein. Therefore an adequate supply of protein of good biological value is indicated. Here we see a confirmation by physiology of the old clinical dictum that in a chronic disease consideration for the patient as a whole is more important than theoretical rest for a diseased organ.

(3) Mild diabetes in the old is often controlled by a low carbohydrate diet without insulin.

(4) For constipation the residue in the diet should be increased and liberal quantities of vitamin B supplied. Aperients are often necessary. In many cases, an ordinary diet plus aperients gives better results than a high residue diet.

(5) For diarrhœa a low residue diet is required and drinks and foods which produce flatulence should be avoided. Such drinks and food include beer, effervescent minerals, cheese and sweets. Arrowroot, milk and blackberries are regarded as of value in diarrhœa. Essex Wynter spoke highly of the value of arrowroot.

(6) For dyspepsia [see p. 52].

It is important to remember that monotony in a severely restricted diet leads to indigestion and misery. Further in spite of all that is advised, the aged often refuse the well-meaning checks of the physician and prefer eating "good and hearty" to living long lean years. Wise was the remark made by a doctor to an old lady who asked what she should eat: "if you don't know at 70, you never will."

## DIETS

*A Simple* 100 *gm. Carbohydrate Diet.*
(*After J. W. Linnell*).

| | | C.H. |
|---|---|---|
| Milk | ½ pint | 15 gm. |
| Bread | 2 oz. | 30 „ |
| Potatoes or Peas or Broad Beans | 7 oz. | 35 „ |
| One Orange or Grape Fruit<br>or Apple or Pear | 6 oz.<br>4 oz. | 10 „ |
| Onions or Carrots | 6 oz. | 10 „ |
| | | 100 „ |

As much as you like of:—

Asparagus, French beans, cabbage, cauliflower, celery, cress, greens, horse-radish, lettuce, marrow, radishes, rhubarb, scarlet runners, seakale, spinach, tomatoes, water, weak tea or coffee.

The following should be taken in moderate quantities :—

Bacon, fish, mutton, chicken, butter, cream, etc. (i.e. fat and protein foods).

All sweetening must be done with saccharine; NO sugar must be used.

### DIET FOR ARTERIOSCLEROSIS

*Breakfast.*

Stewed apricots or prunes or cornflakes with cream and sugar. Egg on toast or scrambled egg or fish. Weak tea and cream and sugar.

*Luncheon.*

Celery or asparagus soup, vegetable salad. Brown bread and butter. Fresh fruit salad or rice pudding with cream.

*Tea.*

Tea with lemon and sugar. One thin slice of bread and butter. Marmalade.

*Dinner.*

Lamb chop or chicken, or halibut or sole. Potato in jacket or boiled. Pineapple or apple with cream. Weak coffee with cream and sugar.

### DIET FOR DYSPEPSIA

*Breakfast.*

Boiled fish or egg (excluding hard-boiled) or bacon. Toast or stale bread (one slice) and marmalade. Weak tea or weak coffee.

*Luncheon.*

Chicken and bread sauce or lamb with one boiled potato and cauliflower (not the stem) or young scarlet runners. A little stewed apple or a digestive biscuit.

*Tea.*

Weak tea with milk and one lump of sugar. A thin slice of bread and butter.

*Dinner.*

Boiled or steamed fish, thin bread and butter, or mutton chop or cutlet. Blancmange or stewed apples or junket. Water to be taken between meals.

### DIET FOR CONSTIPATION

*On waking* take a cup of hot weak tea or if preferred water.

*Breakfast.*
"All-bran." Two stewed prunes and cream. A little brown bread, butter and marmalade. Weak tea or coffee.

*Lunch.*
Chicken or lamb, with cauliflower (or cabbage) and a slice of brown bread (or two rivita biscuits) and butter. Stewed apples or pears or a fresh apple.

*Tea.*
Brown bread and butter with marmite.

*Dinner*
Fish and a slice of brown bread and butter. Bemax and milk.

Plenty of water or Vichy water should be taken between meals.

The following two diets are examples of low carbohydrate diets used at Charing Cross Hospital :—

A

| | |
|---|---|
| Carbohydrate | 38 grammes |
| Fat | 118 grammes |
| Protein | 72 grammes |
| Calories | 1500 |

*Breakfast.*
Tea or coffee, *ad lib.*
Milk, 2 oz.
Eggs, 2.
Bacon, 1½ oz.
Tomatoes, 3½ oz.
Orange, 2½ oz.
Butter, ¼ oz.

*Dinner.*
Soup—Hot water and marmite or beef extract, *ad lib.*
Lean meat, 2 oz.
Butter or fat of meat, ⅓ oz.
Potatoes, 1½ oz.
Salad cream, 1 oz.
Apple, 2 oz.

Tea.
Tea, *ad lib.*
½ Vita-weat biscuit.
Milk, 2 oz.
Cheese, 1 oz.
Butter, ¼ oz.

*Supper.*
Steamed fish, 3 oz.
Potatoes, 1 oz.
Butter, 1 oz.
Custard—1 egg, milk, 2½ oz., water, 2½ oz., vanilla or saccharine to taste.

### B

| | |
|---|---|
| Carbohydrate | 49 grams |
| Fat | 144 grams |
| Protein | 75 grams |
| Calories | 1800 |

*Breakfast.*

Tea or coffee, *ad lib.*
Milk, 2½ oz.
Eggs, 2.
Bacon, 2 oz.
Tomatoes, 7 oz.
Orange, 2½ oz.

*Dinner.*

Soup—Hot water and marmite or beef extract, *ad lib.*
Lean meat, 2 oz.
Butter or fat of meat, ½ oz.
Potatoes, 1½ oz.
Lettuce, *ad lib.*
Salad cream, 1 oz.
Orange, 2½ oz.

*Tea.*

Tea, *ad lib.*
Milk, 2½ oz.
1 Vita-weat biscuit.
Cheese, 1 oz.
Butter, ½ oz.

*Supper.*

Steamed fish, 3⅓ oz.
Junket—Milk, 5 oz., whipped cream, 2 oz., saccharin or vanilla to taste.
Potato, 1 oz.
Butter, ¼ oz.

These (A and B) are basal diets. The addition of 3 oz. of bread would increase the carbohydrate content by 45 gm. and the calorific value by at least 180.

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# NURSING AND CARE OF THE BEDRIDDEN PATIENT

By MISS E. C. PEARCE.

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IN the nursing care of bedridden patients avoidance of routine is important and the provision of interest, occupation and amusement should be given due consideration.

The causes of being helpless and in bed are numerous, the young as well as the aged may be afflicted by long or incurable disease, some may be in bed for months or a year or two, others having to spend the remainder of their lives in bed. Amongst these are spinal lesions resulting in paralysis, severe hemiplegia, chronic rheumatism and septic arthritis. Many bedridden patients are suffering from conditions which are offensive to others, such as cases of cancer seen too late for treatment to be of use; intractable skin diseases, advanced disease of the heart with œdema and marked dyspnœa, cases with chronic cough, advanced cases of cirrhosis of the liver with ascites and constant vomiting.

The degree of helplessness varies. Many patients require feeding; some cannot even wipe their own noses; in many cases the mouth needs constant attention; a large proportion are incontinent and need frequent changing and washing and the parts on which they lie, being subject to moisture and pressure, need routine treatment four-hourly day and night for the prevention of bed-sores (see p. 58). For all these patients skilled nursing attention is necessary, and the staff should permit of the nurses having time to talk with the patients, and help them to be interested and to keep them as active as possible, lest any power which remains in crippled or partly paralysed limbs should be lost by inaction.

A helpless bedridden patient is forced to lie watching a monotonous routine go on around him, therefore monotony and routine should as far as possible be avoided. He should never have to feel that he is the subject of routine but always that routine can and does give place to his needs and desires.

Four-hourly treatment of the pressure points, for example, should give way to the wish of the patient to rest or doze; a routine dressing of skin lesion or wound can be delayed to enable the patient to finish a page or two of the book in which he is interested or a conversation he is having with another. When this method is adopted the patient retains his self-respect, realizes that he is the first consideration, and lends himself to the necessary treatment, taking the interest in it which helps him to keep a contented mind.

Nursing is an art which needs much practice; in caring for those who are chronically ill the nurse will find that the patient is her principal teacher, since from him she will learn how to alter his position in bed without injuring his skin or giving pain, and how to move the painful contracted limbs or aching head and dispose them comfortably. Some hospital authorities consider that experienced nurses should be kept permanently in the wards devoted to the chronic sick; but others, more wisely it would seem, advocate fairly frequent change of nurses and it would be well worth while, from the point of view both of patient and of nurse if every hospital nursing school could be persuaded to send its young trainees for several months to an institution where the chronic sick are domiciled. The patients might look askance at each new face, but the advent of bright young nurses would bring a new diversion into the lives of the helpless sick who, becoming interested in the future career of each one, would come to appreciate the patient's part in helping to form the character and train the hands which go to make a good nurse.

The nurse, on her side, will find that she can drop that idea of routine which may be so important in the nursing of cases of acute disease when the illness is short and sharp, she will find fuller opportunities to develop ingenuity—the possibility of causing pain and discomfort is so imminent that she learns to forget herself entirely in concentrating on and adapting her movements to, the needs of each individual, and therefore devotes all her attention to the patient whom she is handling.

Many bedridden patients are heavy, needing more than one nurse to move them in bed, and adequate domestic assistance should be forthcoming. The nurse who is washing and changing patient after patient, each of whom may be needing this treatment four-hourly should be relieved of carrying screens, changing the water used for washing, bringing clean linen to the bedside and removing soiled linen.

### DETAILED MANAGEMENT

The needs of the helpless bedridden patient vary with his condition; in the case of aged persons who are ill, apart from the care of the skin which is subsequently dealt with, the following points should be considered:—

*Avoidance of burns* in using bed-warming apparatus such as hot-water bottles and electric blankets; in applications of heat such as poultices and fomentations and in the use of thermogene wool sprinkled with spirit, as the skin of old people is tender and easily injured by heat.

The *management of the gastro-intestinal tract* is another important point. Many aged persons are practically toothless, the gastric secretion is diminished and heartburn, dyspepsia, abdominal distension and constipation or diarrhœa are all common complaints. Abdominal distension may be serious and the nurse should be prepared to note its occurrence at the outset. It is often due to injudicious feeding and it is advisable to limit the patient to small drinks of whey and sweetened soda water and to apply hot applications to the abdomen pending the next visit of the physician, who should be summoned if relief is not obtained. The stools of aged patients should be inspected in order to ensure that the bowels are being regularly active; many patients will declare that the action is regular and even frequent when in reality the colon is filled with scybala. Whenever possible these patients should be helped out of bed and allowed to use a commode, as the physical effort entailed by this is much less than that needed for using a bed-pan in bed, especially when the patient is corpulent or œdematous.

The practitioner should decide when, if ever, aperients are needed, and the nurse must be warned that elderly persons require small doses and that, since in such cases, absorption is slow, medicines take longer to act. Purgation must be avoided; the existence of piles should be taken into consideration and, if liquid paraffin is taken, the possibility of seepage should be remembered.

The *impossibility of sleeping all the night through* is a source of annoyance and irritation to many aged persons; short naps are taken during the day and the sleep at night is broken. The nurse should do all she can to prepare the patient for sleep at night, the last meal being light, and excitement avoided towards bedtime. If preparation for the night can be made a ritual—which is sedative because of its suggestion—a great deal will be gained; some aged persons, who can take milk, like Benger's food last thing, others may appreciate a "night-cap" approved by the practitioner, which will be found to produce that sigh of satisfaction which is conducive to sleep.

*Fatigue should be avoided.*—Aged persons are soon tired, they are easily upset and disturbed but almost as easily pacified and reassured. They are pleased with little considerations and can be comforted and made contented by those in whom they have confidence. Visitors who interest and amuse them should be encouraged, but all visits should be of short duration because the patient will brighten up and talk and concentrate during the visit and this can be most fatiguing.

## CARE OF THE SKIN IN THE PREVENTION OF BED-SORES

If a patient has to lie long in bed he is liable to bed-soreness particularly if he is thin, old, œdematous, corpulent, paralysed or incontinent. Nervous diseases which affect the nutrition of the skin, such as transverse myelitis and other spinal lesions further predispose a patient to bed-sore.

The commonest *local causes of soreness are dampness, friction and pressure. Dampness* is the most potent cause as a wet skin becomes sodden and cold and breaks down easily; but it is so very obvious that a patient should have his clothing changed and be washed and well dried whenever his bed is damp or soiled that this point need not be stressed.

*Friction* such as may be caused by a patient restlessly moving about in bed may result in abrasion of the skin, the presence of sharp particles, such as dry crumbs, and creases and rucks in the bedclothing increase the danger; but the most serious cause of injury to the skin by friction, and the one which is usually least considered, is careless handling of the patient when moving him—if a patient with a tender skin, such as may be present in one suffering from spinal disease, is rolled over on the bed the torsion produced between the skin and the sheet on which the patient lies, as he is turned, results in minute abrasions which injure the integrity of the skin. Such a patient should never be turned or rolled, he ought to be lifted as shown in illustration, Fig. 1, both for purposes of changing his bed-clothing and for washing and rubbing his back.

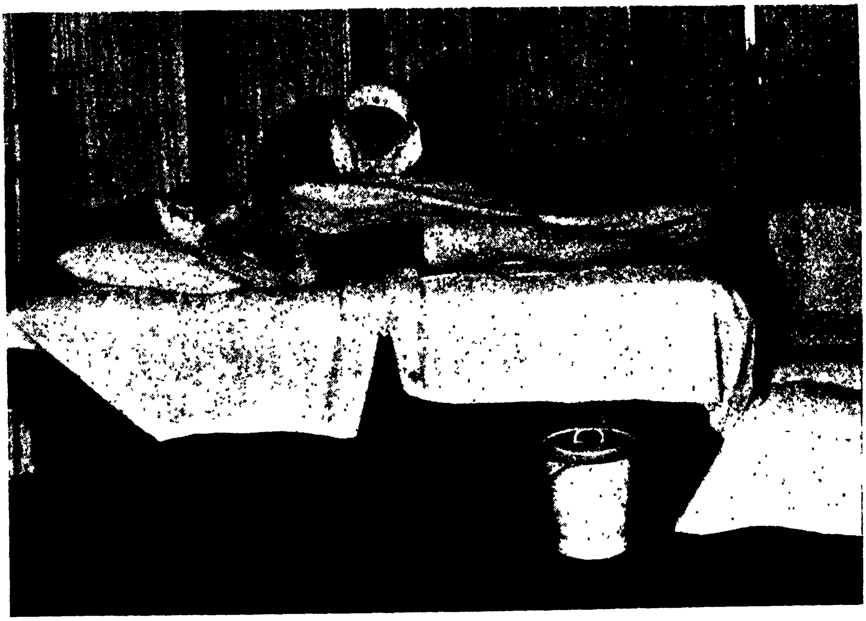

FIG. 1.—Method of lifting a patient for changing the bottom sheet, and for washing and rubbing his back, when the patient may not be turned on his side.

*Pressure* of the patient's body as he lies on the bed, the weight of the bedclothing on the anterior aspect of the body or pressure from a splint or other appliance may cause soreness. The back of the head, shoulder blades, elbows, vertebral spines, sacrum and heels may become sore in the case of those lying on the back; the iliac spines and great trochanters and the lateral aspect of knees and ankles in those who lie on the side.

The medial aspect of the knees and ankles may become sore if these are allowed to press together—speaking generally, no two skin surfaces should be allowed to lie in contact as slight moisture will collect between them and dampness is the most potent cause of soreness in persons lying in bed. The danger of bed-soreness from pressure is increased if crumbs, creases, rucks or lumps, or any unevenness such as may be caused by seams, darns and patches are permitted in the clothing on which the patient lies, or if the sheet on which he rests is allowed to be even slightly damp.

A bedridden patient should lie on a firm, comfortable hair mattress—feather and flocks beds must be avoided as these become lumpy and hot and damp. If the patient is incontinent the mattress may be covered by a mackintosh which fits it so that the danger of creasing is avoided. But otherwise it is inadvisable to use mackintoshes, because they get hot and and retain moisture and so increase the danger of bed-sores. In no circumstances should a mackintosh be placed beneath the drawsheet. Drawsheets are best made of twilled cotton, which is soft and slightly absorbent, and they should be sufficiently long to permit of being drawn through several times to enable the patient to lie on a cool part. Damp or soiled drawsheets should be removed at once. The hospital pattern drawsheet is about two yards long and thirty-six inches wide; the ends may be hemmed but the edges should be of selvedge to provide a smooth surface for the patient to lie on. Mended drawsheets should never be used.

*Routine washing and rubbing* of the parts on which the weight of the patient lies, or of any parts subject to pressure, are carried out at intervals in order to keep the skin in good condition. In some cases four-hourly or even two-hourly treatment may be necessary but, in the majority, general treatment morning and evening, and special treatment of sacrum, buttocks and groins after the use of the bed-pan, will be found sufficient. The articles shown in illustration (Fig. 2) should be brought to the bedside—the provision of a special towel ensures that the patient's bath towels are not used for groins and buttocks, some sisters use washed prepared tow instead of a washcloth, and a non-irritating soap, such as white windsor is best.

After washing the skin, the nurse should soap the palm of her hand and fingers and rub this lather well in; she must not move her hand over the surface of the skin but rub as a masseuse does when kneading the tissues, by working and moving them between her hand and the underlying bone. The object of rubbing is to improve the circulation locally and so maintain the resistance of the skin; it should be continued for from seven to ten minutes and then the soap should be washed off

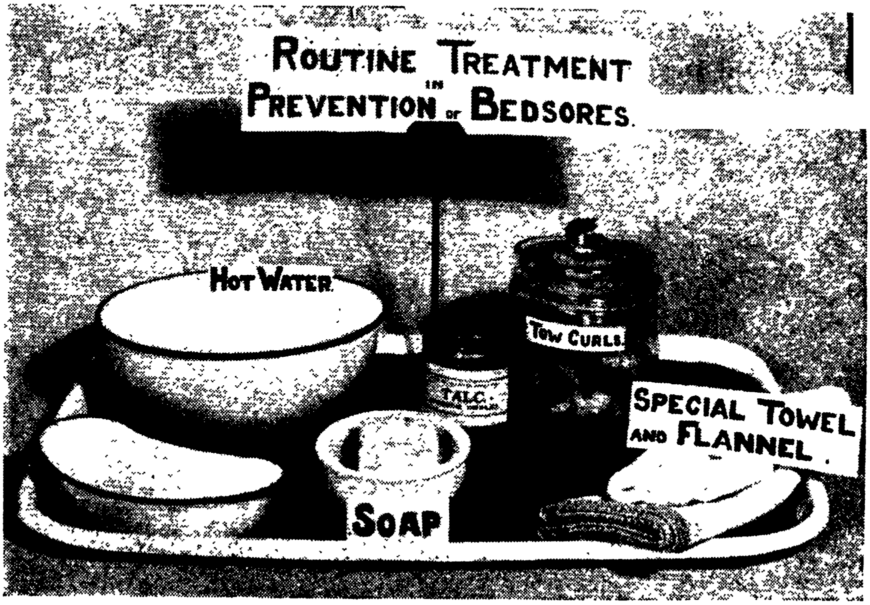
ROUTINE TREATMENT IN PREVENTION OF BEDSORES.
HOT WATER
TOW CURLS
TALC
SPECIAL TOWEL AND FLANNEL.
SOAP

FIG. 2.

and the skin gently dried by blotting—not wiping—and finally dusted with powder to ensure that it is quite dry. Some sisters consider that methylated spirit helps to stimulate the skin; but in many cases it causes dryness and cracking and must therefore only be used with great discretion.

When a patient is incontinent a healing ointment should be applied to the buttocks, groins and inner aspect of the thighs, if the urine and fæces irritate the skin; but it is often found that if the patient is washed and changed immediately no ill-effects ensue.

Various devices can be employed to prevent local pressure; in many cases the use of a full-size air-bed or a Dunlop rubber bed is advocated, or air or water cushions may be employed; in the case of patients who are able to sit up in bed a ring air-cushion helps to keep pressure off the lower end of the spine. Improvised ring cushions can be made from smoothly teased tow and wool, made into a ring and covered with old linen or soft bandages. Small ring-cushions are used to protect the back of the head, elbows, heels, knees and hips from pressure, and in paralysed and incontinent patients it is advisable to bandage wool on to the lower limbs or use cotton-wool bandages to prevent chafing of the skin. In giving the bed-pan great care must be taken to prevent injury to the skin; the pan should have a soft cover or a ring wool-cushion or small air-cushion may be employed.

Moving the patient into different positions, so that he does not always lie, for example, on his back, or on one side, will help; but it should be remembered that he must be lifted into these positions so that his skin may not be dragged over the sheet as might happen if he were merely turned instead of being carefully lifted. In all cases the patient's wishes must be considered; he will often have quite definite ideas about when he would like to lie on his back and when on one or the other side; it may take half an hour or more to get the patient settled in a new position and the pleasure that can be given by a nurse who is kind and observant enough to note his discomfort and patient enough to try, again and again, to alleviate it, will never be properly estimated.

The nurse, or physician, who can make a patient feel quite at his ease and who can convey the satisfying knowledge that his needs alone occupy her mind whilst she is attending to him is helping to provide the spiritual and mental composure which is so effective a component in treatment.

# DIET IN HEALTH AND DISEASE*

## I.—PRACTICAL DIETETICS

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### THE APPROACH TO DIETETICS

A WELL-KNOWN labour leader complained recently that technical experts on dietetics talk in terms of calories, vitamins and proteins, which mean nothing to the layman. He pleaded for the translation of these terms into a more intelligible language. Many will agree with this complaint and second his plea, for even the dietitian himself welcomes a simplification of the terminology which has grown up round that subject. What is needed is a more rapid shorthand way of resuming the modern knowledge of dietetics than an enumeration and evaluation of the amounts of calories, proteins, fats, carbohydrates, mineral matter and vitamins which have been shown to be important if not absolutely essential in human nutrition.

Such simplified statement can be most easily obtained by altering the approach to dietetics. The discussion of the nature and occurrence of the various essentials in diet can be dropped and an inquiry made as to what are the functions of food—what foods do in the body, for what purposes are foods taken. Instead of a chemical approach, which is of necessity technical and complicated, a biological or physiological approach, may be adopted. In this way it will be asked not what foods *are* but what they *do*. The answer is fortunately much more comprehensible and memorizable both to the layman and even the practical dietitian. The two methods of approach are here set out.

(i) *The chemical approach.*—The chemist thinks of a food as being made up, or containing, proteins of differing qualities, fats, carbohydrates, calcium, phosphorus, iron, iodine, sodium, potassium, magnesium, copper, and vitamin A, $B_1$ and $B_2$, C (or ascorbic acid), D and possibly E. Taught perhaps by those who make the large bowel the bogey man of hygiene they may search for roughage as fibre in the food and by the gourmets for extractives. All these are capable of a high degree of estimation, with the exception of the vitamins, and even here, with three of them a fair degree of accuracy may be obtained.

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* Subsequent articles in this series will deal with sick-room menus, prescription of special diets, the effect of cooking upon food, and with special diets for numerous disorders.

(ii) *The physiological approach.*—The physiologist thinks of the functions of food as being (*a*) energy- and heat-producing; (*b*) body building; and (*c*) protecting.

Thus—

| | | | | |
|---|---|---|---|---|
| Fats and carbohydrates | are predominantly | energy producing | materials. |
| Proteins | „ „ | body building | „ |
| Mineral matters and vitamins | „ „ | body protecting | „ |

It may frankly be admitted that the parallelism is by no means exact. Proteins can be and are largely used as energy-producing materials, while derivatives of fats and carbohydrates enter into the structure of the body and so these may be called body-building. Calcium and phosphorus enter into the structure of the bones and teeth in large amounts, and so can (and should) be called body-builders, and proteins in giving rise to hormones in the body might be termed body protectors.

None the less the vaguer and more inexact terminology of the physiologist is more understandable and more useful than that of the chemist. It leads somewhere. As will be shown later the physiologist's line of approach gives a much better viewpoint of a diet under consideration or criticism than that of the chemist, particularly to one who is not an expert.

## THE MEANING OF THE TERMS USED

There is little need to explain the terms energy-producing or body-building as applied to food materials, beyond saying :—

(i) All bodily energy, whether muscular or secretory, chemical or physical, comes from the slow combustion of materials originally though not immediately, from the food. Such energy includes the heat necessary to keep the body at a constant temperature of approximately 98–99° F.

(ii) All the materials necessary for growth of the body and repair of wear and tear, come from the foods and predominantly from the structural materials underlying the living parts of other animals and of plants.

(iii) The third term, "body protecting," does need some definition. As originally applied by McCollum to milk and green vegetables it was intended to call attention to the power of those foods to protect from the results of a dietary too predominatingly cereal in nature. Nowadays it is extended to include all foods which by means of some chemical constituent, present often in small amounts, protect the body against deficiency diseases such as anæmia, rickets, osteomalacia, night blindness, scurvy, beri-beri, and pellagra.

When we turn to the terms used by the chemist and physicist in his approach to dietetics we are on more exact ground.

*Energy material.*—The calorie (or as perhaps it should be called, the kilocalorie)* is the heat necessary to raise one litre of water through one degree centigrade. Approximately this is the same as the heat required to raise one pound of water through four degrees Fahrenheit—a more familiar conception. The average male, as will be seen, gives out energy, either in the form of heat or physical energy per day equal to about 3,000 kilocalories and therefore needs to combust material in the body from which this 3,000 kilocalories may be obtained. Most foods will yield calories to the body, but some yield, as will be seen, much more than others.

*Body building material.*—Proteins are extremely complex bodies, made mainly of chains of amino-acids coiled into spirals perhaps or wound into balls. Their importance to the body consists in the nature of the amino-acids they contain. Thus the amino-acids arginine, cystine, histidine, lysine, phenylalanine, tryptophane, and tyrosine are of immense importance in building up human protein. The body cannot get along without them ready made in the food eaten. Consequently a protein which has in it these amino-acids in the same proportion as in human proteins is of the greatest value in human diet; and a protein which has less or none of any one of these acids than human protein has less value in diet.

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*The calorie of the physicist is the heat necessary to raise the temperature of 1 gramme of water 1 degree centigrade. The great or kilocalorie used by the physiologist is one thousand times greater.

The way this is usually put is to say that a food protein essentially like human protein has a high biological value, whereas one less like human protein has not so high a biological value. There are proteins which, *by themselves*, have no biological value, though in a mixed diet they would be useful.

As a generalization useful in practical dietetics it may be said that animal proteins to be found in cheese, eggs, fish, meat and milk have a high biological value. Egg and milk proteins rather naturally head the list. Vegetable proteins as in cereals, pulses and nuts, have lower biological values, in the order given.

In practical dietetics it is essential that the diet should contain each day a modicum of animal protein—for the amount see below—as a safeguard. Animal protein not only is valuable as the best material out of which human protein can be built but by its presence enhances the biological value of the cereal and vegetable proteins.

*Mineral matters.*—Of the ten or a dozen elements the body must have in its diet (apart from carbon, hydrogen, nitrogen and oxygen), the ones about which the dietitian should feel concerned are calcium, copper, iodine, iron and phosphorus. It is rare to come across any deficiency of sodium, potassium, magnesium, manganese, chlorine or sulphur—though sodium deficiency due to increased loss is met with in miner's cramp and in Addison's disease. On the other hand there is evidence, plausible evidence, of calcium deficiency in a large proportion of the populace both antenatally and postnatally till the time of cessation of growth (Leitch, 1937). *A deficiency of calcium in the diet is to be expected in pregnant and lactating women unless special precautions are taken.*

Iron, too, is frequently deficient in the diet of pregnant and lactating women. Menstruation also causes a drain on a woman's supply of iron which must be made good. There is evidence that the hæmoglobin figure of the blood can be raised in apparently normal women to a figure as high as the average man's by iron; and it is possible that the lower figure accepted as normal for women is simply the result of an under-consumption of iron coupled with the recurring loss at menstruation (Widdowson and McCance, 1936a). (The nutritional anæmia of infants hardly comes within the scope of this article.)

Iodine deficiency is suspected wherever there is thyroid trouble—the Pennines, the Cotswolds and the Mendips—and though not all interested in thyroid trouble are convinced, the majority of workers consider that were the diet adequate in iodine, particularly during pregnancy, childhood and puberty, there would be a marked decrease in simple goitre (Orr and Leitch, 1929).

*Vitamins.*—These substances around which so many magical and mystical ideas wrongly revolve are in the process of chemical identification and synthesis. There are five—possibly six—which are essential in human diet.

(i) Vitamin A.—Chemically this consists of half the molecule of $\beta$-carotene (Holmes, 1937) (the orange pigment of carrots, palm oil, yellow maize) with the terminal carbon atom of the chain oxidized. It is essential for the preservation of skin (Mackay, 1935), membranes and nervous mucous membranes (Green and Mellanby, 1928, 1929), and nervous system (Mellanby, 1935). If the diet is deficient skin lesions, trouble with the conjunctiva, keratinization of respiratory epithelium, deficient regeneration of visual purple, and stone on the kidney are seen. " Nappy " rash occurs in infants, xerophthalmia, keratomalacia, broncho-pneumonia and night blindness.

(ii) Vitamin $B_1$.—Chemically this consists of a pyrimidine ring attached to a thioazole ring, (Williams 1937). It is essential for the oxidation of lactic and pyruvic acids in the nervous system (Peters, 1935), and if the diet is deficient in this vitamin there is widespread paralysis. In man this deficiency accounts for many of the symptoms of beri-beri.

(iii) Vitamin $B_2$.—This has been identified with the lactoflavin of milk, a greenish-yellow, crystallizable water-soluble pigment. The flavins of eggs, liver, kidney, malt and grass seem to be identical, but it may be that other flavins can act as vitamin $B_2$.

In its absence from the diet there is cessation of growth, skin, alimentary tract and (possibly) central nervous system trouble. In man, absence of vitamin $B_2$ is associated with pellagra.

(iv) Vitamin C.—This (until recently (Szent-Györgyi, 1936) ) was considered to be ascorbic acid, a highly reducing " acid " closely related in structure to the hexose sugars. In its absence from the diet scurvy appears, and scurvy it is claimed has been cured by pure crystalline synthetic ascorbic acid.

(v) Vitamin D.—This is a substance (or set of substances) formed by the action of ultra-violet light on the sterols. An "artificial" vitamin D is on the market as calciferol. The function of this vitamin is in making the calcium of the diet available for bone and teeth formation. By lowering the $p_H$ of the small intestinal it enables the body to absorb calcium, and it undoubtedly catalyzes the deposition of calcium phosphate in the bones and teeth. When the diet is deficient in vitamin D, malformation of bone (Mellanby, E., 1925) (rickets, osteomalacia) and teeth results (Mellanby, M., 1934).

(vi) Vitamin E.—The chemistry of this substance is still under discussion. Its presence in the diet is essential for reproduction in the rat. The only reason for supposing that it is important in human nutrition is that women with histories of repeated abortion have been successfully brought to full term by the administration of massive doses of a concentrate of vitamin E (Currie, 1936).

*Vitamins deficient in British diet.*—Of these vitamins it is certain that D is the most commonly deficient in the diet, followed by A, C, $B_1$ and $B_2$ in that order. And it may safely be said that if a diet is satisfactory as regards D, A and C, it is satisfactory as regards $B_1$ and $B_2$, particularly if the common articles of diet are used. It is quite possible by means of concentrates to produce a diet rich in A, C, and D which might be deficient in $B_1$ and $B_2$, but if the normal sources of these vitamins are relied on, and more particularly if care is taken to obtain a reasonable amount of animal protein, there is no risk of a deficiency of the B vitamins.

### NATURAL SOURCES OF MINERAL MATTER AND VITAMINS

*Calcium.*—The richest source among foods is cheese (0·8 to 0·9 per cent.), followed by whitebait 0·859, sprats 0·707, sardines, 0·409. The source most readily taken is cows' milk (0·120 per cent.) Other sources are egg yolk (0·135). Spinach 0·595, watercress, 0·222, and broccoli tops 0·160. It is noteworthy that the boiling of green vegetables hardly reduces their content of calcium.

*Phosphorus.*—The content of phosphorus runs roughly parallel with the calcium except that meat is a good source of phosphorus, and vegetable products are often deficient in phosphorus and when it is present it is often present as phytin in which form the phosphorus is unavailable. Cheese has about 0·54 per cent., whitebait 0·86, sprats 0·64, sardines 0·68, cows' milk 0·094, whole egg 0·254, meats and fish about 0·250. Brown bread has 0·198 with 0·082 (balance 0·116) unavailable, rolled oats 0·339 with 0·224 (balance 0·115) unavailable. Spinach has only 0·098 (all available), watercress only 0·052 and broccoli tops 0·054 per cent.

*Iron.*—The foods with available iron in reasonable amounts are calf's and pig's liver (13 and 20 milligrammes per 100 grammes), eggs 2·5, oatmeal 4·0, dried fruits 2·3 to 3·7 or even 4·0, spinach 2·4. Black treacle is a noteworthy source of iron—9·17 mgm. per 100 grammes. Meat is not a good source of available iron.

*Iodine.*—The noteworthy sources are the fish and the edible seaweeds. A long way after them comes watercress, whereas the iodine contents of vegetable products is so variable that we cannot rely on these as a stable source of iodine.

*Vitamin A.*—The dairy products and green and yellow fruits and vegetables are the best source of these. The international units present in some of these foods are as follows :—

milk 292 per 100 grammes (1,600 per pint) (Sherman, 1937); butter 5,000; cheddar cheese, 3,700; eggs, 1,500–4,600 (i.e. 750 to 2,300 per egg); broccoli tops, 25,000 to 42,500; kale, 36,000; spinach, 20,000; turnip tops, 7,500 to 10,000; apricots, 4,500–12,000; carrots, 4,000; dried peaches, 2,200 –6,000; sweet potato, 3,600.

*Vitamin* $B_1$.—Yeast and wheat germ are the best sources but variable in amount. As much as 23 units per gramme and as low as 6·0 are found; whole wheat and oatmeal run about 3 units per gramme. Most fruits, vegetables and meats run to about 0·5 units per gramme, but meats derived from the pig have a much higher figure (i.e. 2 to 3) (Baker and Wright, 1935).

*Vitamin* $B_2$.—No international unit yet exists ; liver and yeast head the list, then follow the dairy products and the green leaf vegetables—broccoli tops being an especially good source. No natural food, not even the apple, seems devoid of vitamin $B_2$.

*Vitamin C.*—The best sources are the raw summer fruits, the raw salad vegetables and the citrous fruits. Cooking and canning does not result in so much destruction as was thought, though as in the cooking and canning much of the vitamin C does pass out into the fluid and if the latter is discarded, such processes result in a large loss. Storage of vegetables does, unfortunately, result in a very large loss of vitamin C, though it is less at low temperatures. The following figures give the amount of fruits and vegetables which supply 30 mgm. of vitamin C (or rather, ascorbic acid), which is reckoned a sufficient day's ration: Black currant, ½–⅗ oz. (Oliver 1936); strawberry, 1 –2; orange juice, 1½–5½; gooseberry, 2¼–3¾; loganberry, 2 –5¼; raspberry, 3½. When cooked by boiling the figures are, black currant; ½–1 oz.; brussels sprout, 2¼–4; asparagus, 2¾–5; spinach, 2–8¼; gooseberry, 3¾–7; loganberry, 4–4 ; new potato, 4¼–5¾. Other foods with exception of the raw salads, need so large a consumption as to be negligible in practice, with the exception of one apple—the Bramley's seedling, which, raw or cooked, is an excellent source of vitamin C.

*Vitamin D.*—Here, really, is the crux of the vitamin problem.

Few foods are a good source of vitamin D, and it may well be asked if it may not be necessary to have recourse to concentrates. Milk does not exceed 50 units per pint and may be as low as zero. Butter runs from 10–100 units per oz. (Empire butter has the highest figures.) Egg yolk runs from 30–100 units per yolk. The body oil of the fat fishes has a high value (figures not available) and fish livers a still higher value. Cod-liver oil may have a value as high as 1,000 units per teaspoonful, and halibut-liver oil 40–80 units per drop (Coward and Morgan, 1935).

*Summary of sources of mineral matters and vitamin.*—Anyone who has the patience to wade through this mass of facts will note that various foods occur again and again as sources of this or that element or vitamin. For general purposes it may be concluded that the foods which will supply the necessary mineral matters and vitamins are to be found in :—

I. The dairy foods, milk, butter, cheese and eggs.
II. The summer fruits, the citrous fruits, and yellow and green vegetables.
III. The fat fish, especially the oily fish.

The logically minded may wish to extend the list by adding the germ and bran of cereals and liver (or perhaps glandular foods in general), but there seems but little need for this. For practical purposes the above is a comprehensive statement of the case and needs but little expansion.

## THE DAILY RATION

It now remains to give a summary of what is generally agreed should be the daily ration of foods to supply energy, body-building material and protective foods. The figures are taken direct from *The Problem of Nutrition*, Vol. II, *Report on the Physiological Bases of Nutrition*, drawn up by the Technical Commission of the Health Committee, and published by the League of Nations.

### Calorie Requirements

*For every male and female adult.* 2,400 calories per day plus the following for muscular activity :

| | |
|---|---|
| Light work up to | 75 calories per hour of work. |
| Moderate work up to | 75–150 ” ” |
| Hard work - | - 150–300 |
| Very hard work | - 300 calories and upwards. |

| | | | | |
|---|---|---|---|---|
| *For every child* | Age 1–2 | 840 | Calories | per day |
| | 2–3 | 1,000 | ,, | ,, |
| | 3–5 | 1,200 | ,, | ,, |
| | 5–7 | 1,440 | ,, | ,, |
| | 7–9 | 1,680 | ,, | ,, |
| | 9–11 | 1,920 | ,, | ,, |
| | 11–12 | 2,160 | ,, | ,, |
| | 12–15 | 2,400 | ,, | ,, |
| | 15 and upwards | 2,400 | | |

With a supplement for boys and girls 5–11 of 75 calories per hour
,, ,, boys only 11–15 of 75–150 ,,
,, ,, girls only 11–15 of 75 ,,
For pregnant women - - - 2,400 calories per day
For nursing ,, - - - 3,000 ,, ,,

### Protein Requirements

*Adult males and females.* 1 gramme protein per kilogramme body weight (i.e. about 70 grammes per average male and 56 per average female).

| | | | | | |
|---|---|---|---|---|---|
| *Children* | 1–3 | 3·5 | grammes | per kilo | bodyweight |
| | 3–5 | 3·0 | ,, | ,, | ,, |
| | 5–12 | 2·5 | ,, | ,, | ,, |
| | 12–15 | 2·5 | ,, | ,, | ,, |
| | 15–17 | 2·0 | ,, | ,, | ,, |
| | 17–21 | 1·5 | ,, | ,, | ,, |
| | 21 and upwards | 1·0 | ,, | ,, | ,, |
| Pregnant women | 0–3 months | 1·0 | ,, | ,, | ,, |
| | 4–9 ,, | 1·5 | ,, | ,, | ,, |
| Nursing ,, | | 2·0 | ,, | ,, | ,, |

### Protective Foods.

No figures are given, but the importance of protective foods (milk, milk products, eggs, glandular tissues, green-leaf vegetables, fruit, fat, fish and meat) is emphasized.

Especial emphasis is laid upon adequate calcium, phosphorus, iron, vitamins $B_1$, $B_2$, C and D during pregnancy and lactation. For growing children a high proportion of protective goods are recommended.

There are estimates for the necessary amounts of mineral element and vitamins which have been put forward, though they are still open to correction and alteration. For calcium 0·6 grammes per day for the adult male and female; 1·2–1·6. grammes for children and adolescents 1·6 grammes for pregnant and nursing women. For phosphorus the yield should be a little more. For iron probably 10 milligrammes available iron is satisfactory, though pregnant and lactating women might with advantage have 15 mgm. A supply of 5,000 units of vitamin A, 300–400 units vitamin $B_2$, 30 mgm. ascorbic acid and 300 units of vitamin D will probably cover all needs.

## THE USE OF STANDARD FIGURES

These figures for calorie, body-building and protecting materials are useful in so far as they enable a comparison to be made between a known diet and a standard, but they do not aid much in deciding if a diet is satisfactory for an individual. When they are compared with what is actually taken in individual diets of people with no restrictions in purchasing food and in apparently good health, it is realized that diets may deviate far from the average without immediate noticeable effect, and that a hard and fast rule is completely inapplicable in diet (Widdowson and McCance, 1936a), thus the figures for the calorie intake of men may vary from 1,772 to 4,955, for the protein from 97·6 to 167 grammes, the animal protein from 66·6 to 121 grammes, the calcium 0·87—1·96, the available iron 10·8 to 18·7 milligrammes, and so on. The women show a similar wide variation. To take examples the calcium runs from 0·23 to 1·16 grammes per day, and the available iron runs from 5·0 to 12·4 milligrammes per day. We suspect that the low value for calcium, if persisted in, may result sooner or later in osteoporosis, and we know that the average figure for iron (7·9 mg. per day) can be improved upon.

As regards children there are no reliable figures yet in this country, and one must be forgiven for being entirely sceptical of the value of the figures quoted above, and particularly of the index figure assigned to children. Thus in the past it has been customary to consider the calorie needs of a child of (say) three, as a definite fraction of the needs of the adult male (0·42 or 0·5). In view of the fact that the adult male varies so much in his intake it is hard to believe that the child does not vary also as much, and to give an index figure is mathematically absurd, however much it may conduce to clear statement and the support of dogma. Moreover, the index figure applies to calories only, and must not be used to calculate the need for animal protein or mineral matters or vitamins. The need of a child for calcium for instance, is greater than that of an adult male. To calculate from the index figure for calories of a family the need of that family for calcium, iron, iodine, or vitamins is the negation of sound dietetics, of which not even reports of the Ministry of Health and the Medical Research

Council Reports have been innocent.

### PRACTICAL COUNSEL IN DIETETICS

It has been seen that for any one person the strict chemical approach to diet is difficult and, in the present state of ignorance, unscientific. Meanwhile something practical has to be done in devising diets to meet general and specific cases. It is not possible to wait till the scientist has dotted his last i and crossed his last t in dietetics any more than in the XIXth century they could wait for the discovery of microbes before they went ahead with sanitation. There is enough known in dietetics for dietitians to get ahead at once. It is only necessary to discard the chemical approach and adopt the physiological approach.

If any of the three quanta: energy producing, body building and body protecting material is lacking from a diet, that diet is useless. To the necessary ration of energy-producing material instinct is in some sort a guide. Most people—certainly all people who lead a healthy life—adjust their intake of food to their calorie needs with extraordinary accuracy. But for body-building and body-protecting purposes instinct is no guide—witness the diet of the Kikuyu (Orr and Gilks, 1931) and the troubles that beset the native races when they take over the diet of the European (scurvy, rickets, beri-beri).

Consequently the practical way in which to tackle the provision of a suitable diet is to begin with the protective foods, then proceed to the body-building foods, and then to leave the energy-producing foods to the dictates of appetite. If the usual foods upon the market in England are used much as they are used by the middle classes, such a diet will be as good as can be provided in the present state of our knowledge in dietetics. The recommendations of the League of Nations Health Committee proceed implicitly upon those lines.

*The adult male.*—It is here suggested that a satisfactory diet for an adult male will be found in the following :—

| | | | |
|---|---|---|---|
| I. Protective Foods (*a*) | Milk | 1 pint per day | (taken in any form) |
| | Butter | 1 oz. ,, | (=two restaurant pats) |
| | Cheese | 1 oz. ,, | |
| | Egg | 1 ,, | |

| | |
|---|---|
| (*b*) Raw salad, or raw summer fruit or fresh orange, lemon or grape-fruit | 1 serving per day |
| (*c*) Herring, sprats, kipper, bloater, whitebait, salmon, mackerel, fish roes | 1 serving or better 2 servings per week |

II. BODY-BUILDING FOODS.—The minimal ration is very nearly attained by use of the above on the non-fish days, on the fish days it is easily reached. To make it safe add each day—

Meat, poultry, game, fish or liver 3 to 4 oz. uncooked, or 2 to 3 oz. cooked (small to large helping) per day.

III. ENERGY-PRODUCING FOODS.—Cereals, fats, sugars, dried fruits, jam, root vegetables, green vegetables, fruit, till the appetite is satisfied. The normal food habits of the British may as regards these be followed.

*The non-pregnant female.*—Proceed on exactly the same lines. This ensures the woman's receiving a satisfactory amount of protective food and body-building food. She may easily need more of these than the male because of the cyclic changes of, and losses from, the uterus.

*The pregnant or nursing woman.*—Proceed on the same lines except that the milk intake should be raised to one quart. This diet is practically that of the League of Nations Health Committee except that they add cod-liver oil (one teaspoon, for vitamins A and D), give rather more meat, and count potatoes and pulses among the protective foods, whereas the writer would put them among the energy-producing foods. (One cannot be logical!)

*The child.*—As regards the child it seems reasonable to adopt the same procedure: i.e. make sure of the body-protecting and body-building foods and leave appetite to determine the calories. With a young or greedy child this might result in a ketosis and so the following suggestions, based on those of the League of Nations Committee are given.

### CHILD. Age 12–14 years

As for adult males, except that they may possibly not take so much of the energy-producing foods. On the other hand they may often take more. The writer's experience is that the boy's appetite somewhat suddenly becomes enormous in the last prepubertal year and remains high till puberty and/or growth is finished.

Child. Age 7–12. As above. Probably much less of cereals, etc., will be taken.

Child. Age 5–7.

| | |
|---|---|
| I. Protective Foods— | |
| (*a*) Milk | 1 pint per day |
| Butter | ½ to 1 oz. „ |
| Cheese | 1 oz. ” |
| Egg | 1 ” |
| (*b*) Raw salad, raw summer fruit, or orange, lemon or grapefruit | 1 serving per day. |
| (*c*) Herring or other fat fish | 1 or 2 servings per week. |
| II. Body-building Foods.—Meat, poultry, game, fish | 2–3 oz. per day. |

III. Energy-producing Foods.—Cereals, sugar, jam, treacle, plus potatoes and other vegetables (best supply vegetables such as potatoes, greens, carrots, etc., with the meat as is usual) to satisfy appetite.

Child. Age 3–5

| | |
|---|---|
| I. Protective Foods— | |
| (*a*) Milk | 1 pint per day |
| Butter | ½ to 1 oz. ” |
| Cheese (dried, grated) | ½ to 1 oz. ” |
| Egg | 1 ” |
| (*b*) Raw salad, raw summer fruit or orange, lemon or grape-fruit | 1 serving per day. |
| (*c*) Fish roe, fat fish, (bones removed and body put through mincer) | 1 serving once or twice per week. |
| II. Body-building Food.—Meat, poultry, game, fish | 1½–2 oz. per day. |

III. Energy-producing Foods.—Cereals, sugar, jam, treacle, potatoes, root vegetables, greens to satisfy appetite.

Child 2–3 years

| | |
|---|---|
| I. Protective Foods | |
| (*a*) Milk | 1 pint per day |
| Egg | 1 ” |
| Butter | ½ oz. ” |
| (*b*) Raw vegetable or fruit as above or raw tomato, swede, or orange juice | At least 1 and preferably 2 oz. |
| (*c*) Herring roes, or fat fish with bones removed and body put through a mincer | 1 to 2 oz. per day |
| II. Body-building Foods.— | |
| Minced meat, fish, poultry | 1 to 2 oz. |
| or | |
| Grated dried cheese | 1 oz. |

III. Energy-producing Foods—
Root vegetables, cereals, sugar, jam, treacle to satisfy appetite.

CHILD 1–2 years

| | |
|---|---|
| I. PROTECTIVE FOODS— | |
| (*a*) Milk | 1 pint per day |
| Egg | ½ to 1 ,, |
| Butter | ¼ to ½ oz. ,, |
| (*b*) Raw vegetable or fruit juice | 1 to 2 oz. ,, |
| Sieved spinach, greens, etc. | 1 oz. ,, |
| (*c*) Cod-liver oil | ½ to 1 teaspoon per day. |
| II. BODY-BUILDING FOODS— | |
| Minced meat, fish, poultry, etc. | 1 to 2 oz. |
| or | |
| Grated dried cheese not more than | 1 oz. |

III. ENERGY-PRODUCING FOODS—

Sieved root vegetables, rusks, fairy toast, dry bread, jam, treacle to satisfy appetite.

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# RADIOLOGICAL INTERPRETATION OF OBSCURE PULMONARY LESIONS

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DURING the past year the medical unit at Preston Hall has investigated some obscure pulmonary lesions by means of tomography. The principles underlying this most recent advance in radiological diagnosis were outlined in the references given on p. 82. Briefly, the value of tomography over the usual radiological methods is that sections—antero-posterior and lateral—may be taken at any depth of the chest in such a way that it is possible to analyse the various strata of the lung substance at given depths and thereby to eliminate much of the confusion which frequently appears on ordinary films owing to the super-imposition of shadows of varying density. The apparatus which has been used by us has been manufactured by the Sanitas Company under the supervision of Prof. Chaoul of the Charité Clinic, Berlin. It is safe to work and, despite the relatively complicated nature of its mechanism, the technique is readily acquired. Up to the present the work at Preston Hall has been confined almost entirely to the investigation of antero-posterior sections.

## CASE RECORDS

Some of the advantages of tomography may best be explained by the description of two cases which have recently come under treatment.

CASE I.—F. O., aged 25, was admitted on October 2, 1935, suffering from pulmonary tuberculosis affecting both sides of the chest. The sputum was positive. The usual antero-posterior film shown in fig. 1 shows there to be definite cavity formation in the left upper lobe in the neighbourhood of the third and fourth ribs. The outer wall of a cavity can also be seen in the apical region of the same lung. On the right side there is diffuse fibrosis with evidence of cavity formation in the upper zone. In the right lower zone the outline of another cavity can be seen. Figures 2, 3, 4 and 5 represent sections taken at 5, 11, 15 and 18 cm. respectively from the front of the chest wall. These sections should be compared with the antero-posterior film in fig. 1. It will be noted that in fig. 2 there are the outlines of two cavities to be seen in the left upper zone. In fig. 3—the section taken approximately through the middle of the chest—a new cavity is appearing in the lower zone on the left side and the upper zone cavities are becoming more distinct. The lower of the two upper zone cavities shows a densely fibrotic lower wall. In fig. 4—the usual dorsal film—two large cavities come into view, each in the upper zones of the right and left lungs respectively. These two cavities stand out with remarkable clarity. The extremely fibrotic appearances of the well-defined smaller cavity which was noted in the neighbourhood of the third and fourth ribs on the left side are still well marked. It is, however, in fig. 5—taken about 4½ cm. from the skin of the

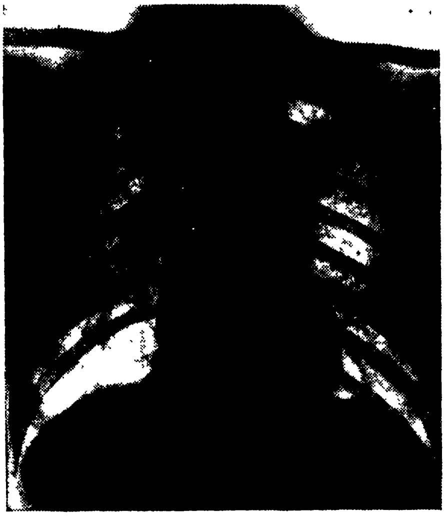

FIG. 1.—Case 1.

FIG. 2.—Case 1.

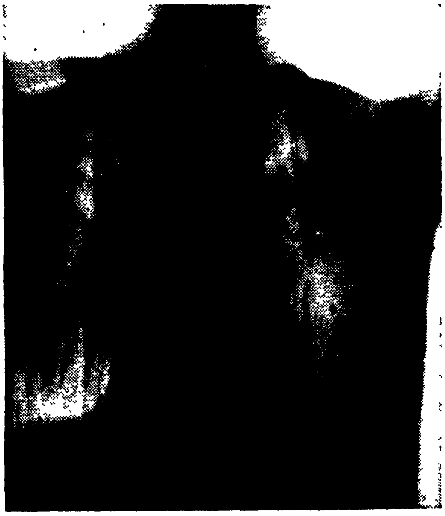

FIG. 3.—Case 1.

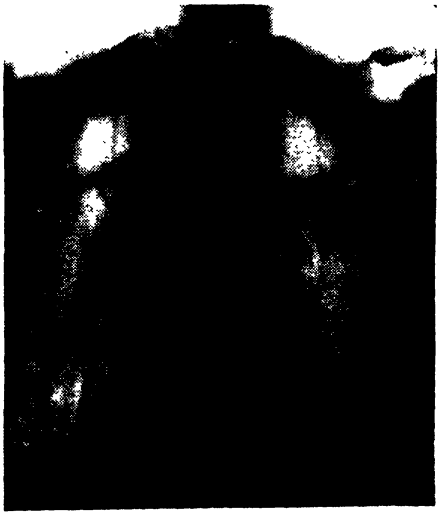

FIG. 4.—Case 1.

back—that the most interesting features are to be observed, for a whole series of cavities now come to light in a way which cannot be delineated with any degree of certainty in the original antero-posterior film. It will be noticed that in all tomograms the rib shadows have disappeared almost entirely from view. Again, cavity formation is best seen in the dorsal tomograms —a common finding in tomography.

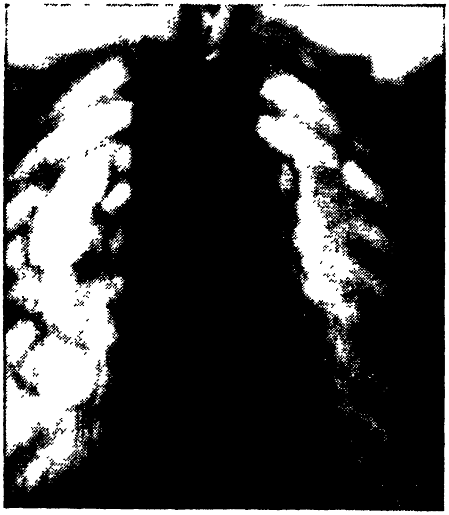

FIG. 5.—Case 1.

CASE 2. C. A., aged 17 years, was admitted on October 18, 1933, and found to be suffering from widespread active disease involving the right side of the chest. Tubercle bacilli were present in the sputum. In view of the relatively satisfactory condition of the left lung collapse therapy was suggested. The patient, however, refused operative treatment and was transferred to another institution, but he was re-admitted to Preston Hall on January 23, 1935 with a view to surgical treatment. The sputum was positive and the general condition of the patient was poor. Total thoracoplasty was performed by Mr. L. O'Shaughnessy at Preston Hall in May, 1935. The patient made an uninterrupted recovery from the operation and the sputum became negative in October of the same year. Towards the end of 1936, however, there was a recurrence of tubercle bacilli in the sputum and the question of further surgical intervention has arisen. Fig. 6 shows the condition of the chest in 1933 prior to operative treatment.

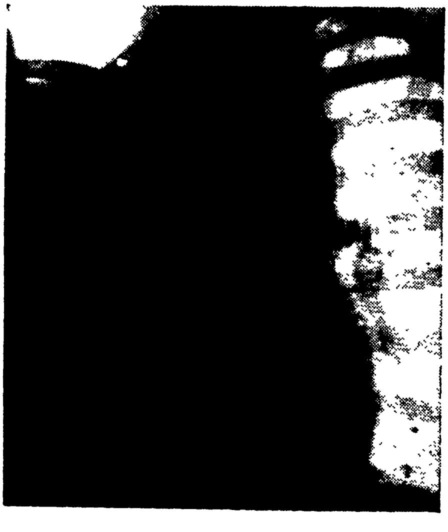

FIG. 6.—Case 2.

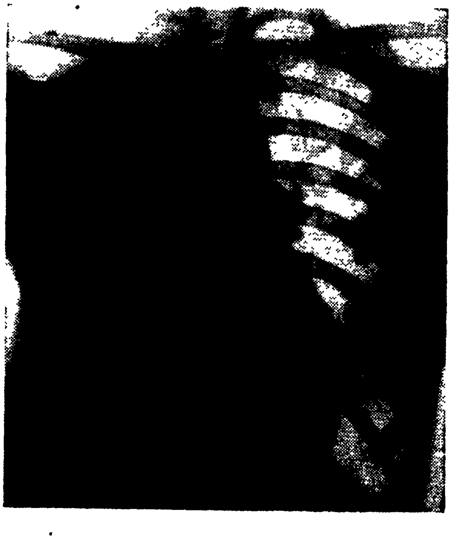

FIG. 7.—Case 2.

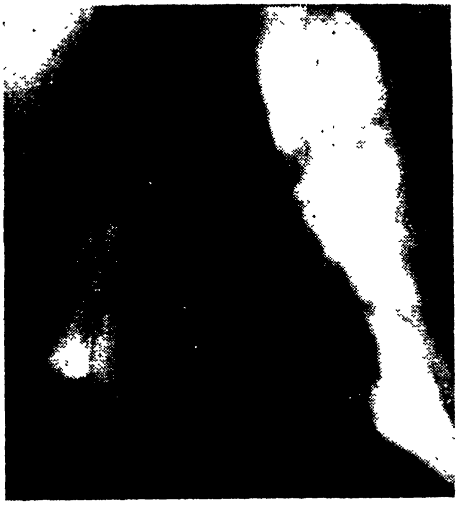

FIG. 8.—Case 2.

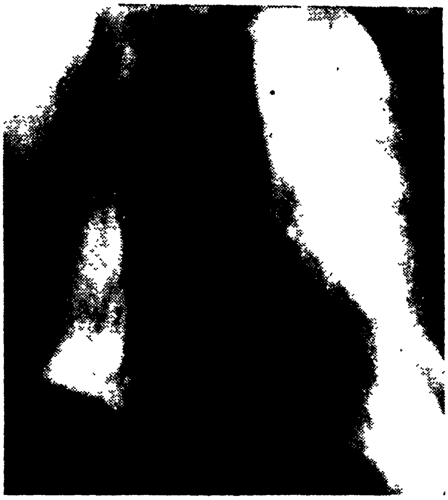

FIG. 9.—Case 2.

Fig. 7 is an antero-posterior film showing the collapse twenty-two months after the operation.

## DISCUSSION

It is the general opinion that it is extremely difficult—as it is in this case—to make out any topographical detail from the film examination in cases which have undergone plastic operations some months previously. Pulmonary fibrosis, displacement of the mediastinum, distorted rib-shadows and pleural thickening all tend to make accurate interpretation a matter of conjecture in a large proportion of instances. Nevertheless it is a matter of great importance to the surgeon to know something of the exact nature of the underlying pulmonary tissue in these cases if further operative treatment is to be undertaken. The two tomograms—fig. 8 and 9—were taken at distances of 11 and 13 cm. from the front of the chest respectively and show quite clearly not only the site but also the shape of the cavity which is still patent in the upper zone of the collapsed lung. The patient is in excellent general condition and is likely to have the cavity compressed completely in the course of a week or two.

It was for this particular type of case that tomography was considered in its earliest days to be most useful, but it is now abundantly clear that sectional analysis of the chest in cases of pulmonary tuberculosis reveals many secrets which are not given by ordinary flat films, however excellent the technique in the X-ray room may be.

The information which has been supplied in cases of incomplete artificial pneumothorax and in all cases of cavity formation is invaluable. We are satisfied that much additional information can be forthcoming from this more accurate method of localization which is still in its youngest phase. Many phenomena appear which are so unusual that it will take many months of close observation before one is able to explain these with any degree of certainty. Post-mortem verification of radiological appearances is most important and in one case in particular in which this has been attempted it has been a revelation to observe the fidelity with which tomography during life has reproduced the pathological appearances found post-mortem.

## SUMMARY

Two cases of pulmonary tuberculosis in which tomography has been used as an additional method of diagnosis have been described. In both cases latent cavities have been brought to light. In the first case, extensive cavity formation unsuspected in the antero-posterior film is shown in the dorsal section of the lungs, and in the second case a patent cavity following thoracoplasty has been accurately localized with a view to complete closure at an early date.

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# MEDIASTINAL PLEURAL EFFUSION:
## WITH NOTES ON FOUR CASES

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MEDIASTINAL pleural effusion is considered a rare condition and, although it was recognized clinically before the advent of X-rays, it is only since the development of radiology that it has been possible to gain a clear conception of its frequency and its varying manifestations. For a short period after the introduction of radiological investigation, the diagnosis was made more frequently and the condition appeared to be more common than was supposed, but it soon came to be recognized that a proportion, at any rate, of the increase was due to incorrect X-ray interpretation. Rist, Jacob and Trocmé drew attention to this and pointed out that such conditions as collapsed lower, or accessory lobes, bronchiectasis, mediastinal tumour, and pericardial effusion, had frequently been mistaken for mediastinal pleural effusion. Though mediastinal pleural effusion is by no means so rare as was once thought, it is unlikely that an accurate estimate of its frequency will be possible until radiology plays as large a part in the investigation of acute respiratory affections as it has hitherto in the diagnosis of chronic chest diseases.

Mediastinal pleural effusion may be defined as an effusion of fluid into the layers of the pleura which line the mediastinal aspect of the lung and the lateral walls of the mediastinum. Such effusions may spread into the diaphragmatic or parietal pleural spaces or into the interlobar fissures. The usual classification of mediastinal pleural effusion is made on anatomical grounds. Sagel and Rigler (1930) divide them into four types—(1) Anterior, right or left; (2) posterior, right or left; (3) bilateral; and (4) "saddle" type, in which the effusion is found in both the anterior and posterior spaces. Further subdivision is sometimes made into superior or inferior according to whether the effusion is above or below the root of the lung. For general purposes, these classifications are sufficient. The effusions are either serous, purulent or hæmorrhagic, and radiologically it is impossible to differentiate between them.

The evidence afforded by the literature as to the relative frequency of the various types is somewhat conflicting. According to some authors the anterior type predominates, whereas others maintain that the posterior is the more common. D'Hour (1936), expressed the opinion that the posterior is by far the most frequent type and the consensus of opinion now appears to be in agreement with him. Right-sided effusions are more common than the left and are usually inferior in position. The anterior bilateral type (one case of which is here described), is exceptionally rare, and few cases have been reported.

Serous effusions are generally regarded as tuberculous in origin, and the bulk of the available evidence supports this view. It is possible, however, that influenza, pneumonia, and other conditions, have not been sufficiently recognized as causative factors. A case reported by Snure (1932) followed post-influenzal asthenia, and, it may be of interest to note, that one of the present cases occurred at the height of a widespread influenza epidemic, and gave a history of influenza before admission to hospital. In another case the effusion, which disappeared gradually, was associated with a right basal pneumonia, and in a third, the effusion was secondary to a purulent mediastinitis. In the serous type the fluid is absorbed spontaneously and sometimes rapidly. In a case of the anterior bilateral type, described below, in which a large effusion appeared to be present, absorption was complete in fourteen days. The purulent form is usually secondary to pneumonia, but it may follow injury, neoplasm, or inflammation of any of the mediastinal contents. This type is nearly always fatal unless relieved by surgical measures. A few cases, however, are reported in which spontaneous healing took place after rupture into a main bronchus or the œsophagus.

### CLINICAL FEATURES

The early symptoms are vague and the condition is frequently overlooked or incorrectly diagnosed until a radiological examination has been made. According to the classical description of Dieulafoy,

> " Mediastinal pleurisy starts as an acute febrile attack with pain, fever, cough, and dyspnœa. The symptoms caused by pressure on the mediastinum are dyspnœa, stridor, sucking in of the chest wall, dysphagia, distension of the veins of the chest, fits of coughing and suffocation, hoarseness, dysphonia and spasm of the glottis. All or only some of the symptoms may be present, according to whether the pressure is on the trachea, the œsophagus, azygos vein, the pneumogastric or recurrent laryngeal nerve."

Although most writers on the subject give this quotation, it may be worth observing that in their recorded cases, symptoms from compression of the mediastinal contents are strikingly lacking. This, as Rose (1914) suggests, is probably due to the fact that a mediastinal effusion enlarges by spreading into the lung fields rather than into the mediastinum. In Rose's own case, the signs of mediastinal compression were surprisingly few despite the presence of a very large effusion, which was confirmed at post-mortem examination. In all four cases here recorded, there were no signs or symptoms suggestive of mediastinal compression. The frequent absence of pressure signs should be stressed, as the diagnosis will be missed, or delayed, if one waits for these signs to develop.

On clinical examination, the signs are usually indefinite. If enlargement of any of the mediastinal organs, such as the heart, aorta and retrosternal thyroid, can be eliminated, then dullness anteriorly or posteriorly associated with cough, fever, dyspnœa and pain in the chest, should suggest the possibility of a mediastinal effusion, and indicate the necessity for radiological examination. When empyema has developed, high fever, sweating, and prostration will be present, and if occurring in the posterior mediastinum, the signs of early mediastinal compression may be observed.

### DIFFERENTIAL DIAGNOSIS

The conditions which may give rise to difficulty in diagnosis are chiefly, mediastinal tumours, paravertebral abscess, pericardial effusion, enlarged mediastinal glands, collapsed lower or azygos lobe or intrathoracic goitre, but attention to the following points should obviate an incorrect diagnosis. Mediastinal tumours are usually situated at the root, and show rounded outlines. In paravertebral abscess, though there may be a fusiform shadow lateral to the spine, disease of the vertebræ should be evident. With pericardial effusion, the shadow is even in density and the outline of the heart is not seen, whereas in mediastinal effusion, it should be readily visible. Enlarged mediastinal glands are usually bilateral and give a more globular outline than an effusion. Collapsed lobes may cause difficulty in diagnosis, but evidence of compensatory emphysema and bronchiectasis is usually present. Introthoracic goitre may resemble an effusion in the superior mediastinum, but screen examination will establish the fact that the shadow moves with deglutition.

No special treatment is indicated in the serous effusions, as they absorb spontaneously. The purulent, however, call for surgical intervention, when the effusion should be drained after rib resection.

## CASE RECORDS

Case 1.—E.N., female, aged 26 years, was admitted to hospital with a diagnosis of influenza. She complained of cough and a stabbing pain in centre of chest in front and at the back, which was made worse on inspiration. Her temperature was 101° F., respirations 24 and pulse 120. Physical examination revealed an area of dullness on the right side of the sternum continuous with the cardiac dullness and also at the left base together with fine râles. The heart was in the normal position. The tem-

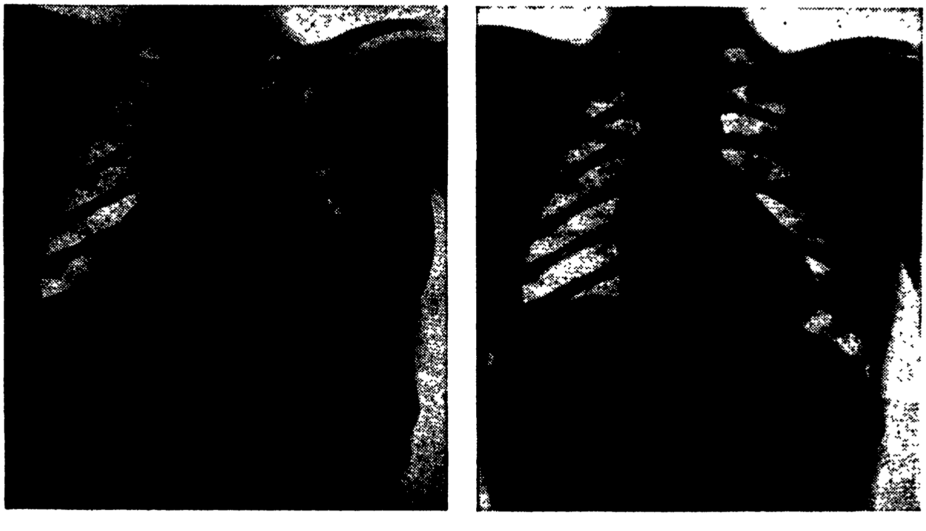

**Fig. 1**—Case 1 (*a*). Bilateral mediastinal effusion.

Case 1 (*b*). Showing complete absortion of the effusion after 14 days.

perature ranged from 99° to 101° F., but gradually reached normal limits by the end of ten days. The sedimentation rate was 44. The pain disappeared in forty-eight hours, but the cough persisted for a week. The sedimentation rate after one week was 24.

X-ray examination shortly after admission showed a wide mediastinal shadow, stretching on either side from the clavicles to the diaphragm. The lower part of the shadow was continuous with the diaphragmatic pleura. In the A.-P. view, the contour of the heart was readily seen within it. A lateral view showed the shadow to be anterior in position. There was also a small shadow over the left costo-phrenic angle. Both lungs were clear and showed good translucency. Further X-ray examination three days later, showed considerable diminution in the size of the shadow. One week later, the mediastinal and pleural effusions were completely absorbed. Clinically the dullness had entirely disappeared, and the patient had made a complete recovery.

Case 2.—T. M., male, aged 8 months, moderately well-nourished, with no history of any previous illness, was brought into hospital for investigation as his mother was suffering from advanced pulmonary tuberculosis. The temperature was normal, pulse 128, respiration rate 24. There was no cough. Mantoux reaction gave a weak positive. Physical examination showed impairment of percussion note over the lung roots with whispering pectoriloquy towards the angle of the left scapula. The heart appeared to be displaced slightly to the right. X-ray examination soon after admission to hospital revealed a dense shadow with a well-defined smooth border running from the inner part of the right clavicle to the right cardio-phrenic angle. Its outer border was convex, and laterally extended almost to the axilla. The right side of the heart was seen within it. An oval dense shadow was present at the right hilum which was considered to be due to an enlarged gland. A lateral view showed that the effusion was posterior in position. Later X-ray examinations showed progressive diminution in the size of the mediastinal shadow. While in hospital the patient remained free from symptoms and was discharged convalescent. Further study of the

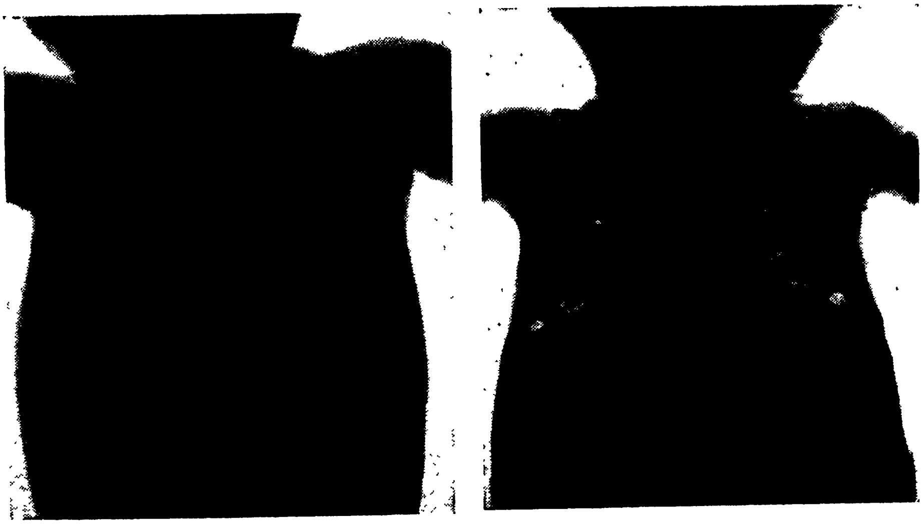

Fig. 2—Case 2 (a). Right-sided mediastinal pleural effusion.

Case 2 (b). The effusion is absorbing. (eight weeks later.)

progress of this case has not been possible.

CASE 3.—E. H., female aged 14 years, was admitted to hospital with history of sudden attack of acute pain in right chest, five days previously accompanied by shivering and a troublesome cough which aggravated the pain. There was nothing of note in the previous history or in the family history. On admission, patient was poorly nourished and slightly cyanosed; temperature was 102°, pulse 116 and respirations 26. On physical examination there was an area of dullness at the right base posteriorly where breath sounds were weak. The heart was not displaced. A systolic murmur was present at the mitral area. In hospital, the temperature ranged from 99° to 102° F., pulse 120 to 140, and respirations 30 to 40. After one week her general condition began to deteriorate. Cough and sweating were troublesome, and, on physical examination, there was an increase in the area of cardiac dullness, together with dullness at the right base as before, and dullness was now apparent at the left base. Paracentesis of the left chest was performed and 15 oz. of clear fluid removed. Similarly 6 oz. of clear fluid were obtained from the right side. No organisms were grown on culturing the fluid. Paracentesis of the pericardium was then done and 7 oz. of opaque fluid removed. This contained many pus cells, streptococci, and a culture gave the growth of *Streptococcus viridans*. Drainage of the pericardium was then carried out by rib resection, under a general anæsthetic. Only temporary improvement resulted and the patient died. X-ray examination the day following the admission to hospital, showed a great enlargement of the mediastinal shadow. The shape on the left side conformed to that of the left border of the heart. On the right side there were three distinct bulges, one in the upper part of the mediastinal, one in the lower, and a third in the inner part of the interlobar fissure. The heart was displaced to the left. After rib resection, X-ray examination revealed that the mediastinal shadow had decreased considerably in size and a pneumo-pericardium was now ob-

FIG. 3—Case 3 (*a*). Right-sided mediastinal pleural effusion with an extension into the interlobar fissure and an accompanying pericardial effusion.

Case 3 (*b*). A lateral view, taken ten days later, showing pneumo-pericardium, and mediastinal pleural effusion in front of the heart.

served along with a diaphragmatic and a parietal pleural effusion at the right base. A lateral view showed that the mediastinal effusion was anterior to the heart. The line of the right-sided mediastinal effusion was still present, but less prominent. The findings at the post-mortem examination were as follows :—" Both pleural cavities contained clear effusions with a little jelly-like clot, 1 pint on the right, ½ pint on the left side. The pericardium showed sero-fibrinous pericarditis and contained about 1 oz. pus. There was collapse of the lower half of the right lower lobe, and a little subpleural collapse and slight purulent bronchitis of the left lower lobe. A right anterior purulent mediastinitis with an associated effusion into the mediastinal pleura extended upwards from the pericardium. Two abscesses were present in the left frontal lobe of the brain, one in the right frontal lobe, and one in the right parietal lobe."

Case 4.—R. N., male, aged 8 yrs., had a serious illness in 1930 lasting many months, which was apparently due to pneumonia. A diagnosis was made of mediastinal effusion with a peripheral effusion at the right base. An X-ray examination on 13.7.30, showed a large right-sided mediastinal effusion with consolidation in the right lower zone. A month later the mediastinal effusion had diminished in size. A few months later there was residual shadowing at the right base, and the mediastinal shadow had disappeared, but there was now a shadow at the right cardio-phrenic angle which suggested either a residual effusion or collapse of the lower lobe. Two years later the shadowing was slightly less, and pointed to basal fibrosis and collapsed lower lobe. Three years later (that is—five years after the first X-ray examination) a lipiodal injection showed bronchiectasis of the right base, and of the collapsed lower lobe with emphysema of the surrounding lung. Unfortunately no lateral radiographs were taken, so it is not possible to say whether this right-sided effusion was anterior or posterior in position.

## SUMMARY

(1) Four cases are recorded of mediastinal pleural effusion. (2) A clinical syndrome is described which is suggestive of this condition. (3) For accurate diagnosis, radiological investigation is essential. (4) Tuberculosis is the principal factor in the serous type, but other causes must be considered. Pneumonia is the principal agent in the purulent form.

We are greatly indebted to Dr. A. S. Hall, Tuberculosis Medical Officer to the Middlesex County Council for the history of case 4, and to Dr. H. E. A. Boldero, and to Dr. C. D. Agassiz, for much valuable help.

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# TRACTOR SICKNESS

By E. I. PUDDY, M.B., B.S., M.R.C.S., L.R.C.P.
*Litcham, Norfolk.*

MANY occupations have diseases peculiar to themselves, and the following notes may prove of interest to country practitioners as shedding light on otherwise obscure cases of vertigo and/or vomiting in agricultural labourers who are tractor drivers. Having talked with many of them I find that nearly every full-time driver suffered at the start from the same symptoms as a schoolboy smoking his first pipe. Many acquire a tolerance, but the residue never do, and the recognition of these cases is necessary to put them on the road to health again.

The cases to be described were probably suffering from poisoning by carbon monoxide and other combustion products of paraffin oil, for agricultural tractors start on petrol and switch on to paraffin when warmed-up. For twenty minutes or more, the exhaust fumes are black with unburnt products. When the engine becomes thoroughly hot the fumes become less visible.

Tractor exhausts are of three types with vertical, side or down pipes. Tractors such as the " Case" and "Massey-Harris" which have vertical exhausts give rise to no illness, and it is only with those machines fitted with side or down exhausts that this article is concerned. The down pipe types are the worse offenders, for a tractor at work in second gear moves at about 3 m.p.h. and the driver is bathed in exhaust gases which are not swept away as in the case of a fast moving car. A new tractor does not cause any ill effects and it is only when the piston rings and valve seatings become worn, that the exhaust gases become noxious, their effects becoming most noticeable under the following conditions :—(1) If the tractor has a "side" or "down" exhaust. (2) In a head or following wind. (3) If the engine is in bad condition. (4) If the tractor is pulling hard.

The *position* of the exhaust-pipe is of paramount importance.

A vertical exhaust shoots the hot gases into the air, to pass over the driver's head without affecting him. The gases from a side exhaust will only influence the driver if the wind is in the same direction as the lie of the work, for if a tractor moves at 3 m.p.h. and there is a following breeze of 3 m.p.h. then the exhaust gases are stationary relative to the tractor, but on the return journey will blow past the driver at 6 m.p.h. The "down" exhaust is the most malign type, for the hot gases are discharged directly under the driver's feet, and not only make his boots uncomfortably hot, but rising as hot gases do, surround him in a sweltering and poisonous atmosphere.

The condition of the engine is of importance, for as mentioned, a new engine does not give rise to symptoms no matter what is the position of the exhaust. But what farmer can afford to buy a succession of new tractors to avoid ill effects on his men? Sooner or later wear takes place, combustion becomes less complete and leakage occurs, which is especially noticeable when the compression in the cylinders is increased on hard pulling as when ploughing deep.

### CAUSE OF SYMPTOMS

What is the actual factor in the exhaust fumes which cause the symptoms? It may be carbon dioxide, unburnt paraffin vapour, or, in my opinion, carbon monoxide. It is well known that it may be fatal to warm up a car engine in a closed garage as the carbon monoxide in the exhaust fumes are unable to escape into the open air, and the percentage of carbon monoxide in the confined space may rise dangerously high. Carbon monoxide, a colourless and odourless gas, has a great affinity for the hæmoglobin of the red blood-corpuscles, uniting firmly with it, and ousting the oxygen normally carried, with resulting oxygen-starvation—the symptoms being headache, vertigo, and nausea, followed by vomiting, weakness of the limbs, leading to unconsciousness, and finally death, if the patient is not removed from its effects in time. In the open fields the concentration of exhaust fumes can never rise as high as in a closed space, but that it can give rise to momentary unconsciousness is indicated by the first case described.

Some of the patients complained of epigastric pain, radiating to both costal margins, accompanied by anorexia, nausea and vomiting, but no vertigo or headache. These patients also complained that all their food tasted of paraffin, an unpleasant state of affairs to say the least of it. It would seem that the responsible factor here is not so much the carbon monoxide, as the incompletely combusted paraffin-vapour from an engine in bad condition.

## CASE RECORDS

CASE 1. A. B. Aged 39.—*Symptoms:* Vertigo, anorexia and nausea leading to vomiting in the evenings, about 1 hour after high-tea. "The room seemed to suffocate him." At times everything went blank, and on occasions he fell without warning, hurting himself.

*Physical Signs.*—None to account for symptoms.

*Treatment.*—Dieting proving of no avail, he had several septic teeth removed, with disappointing results as no improvement resulted. At a later date he volunteered further information when I was in a position to ask leading questions. (No Norfolk labourer will volunteer information unasked !) He had been a tractor driver for ten years, during the first six of which he had suffered no effects, until his master bought a different type of tractor with a "*down*" exhaust, the outlet of which was just under his feet. Following the change he had been constantly unfit during the last four years, but dared say nothing as he had no other work in view. Driving the tractor round the fields on an average ten hours a day for six days a week, he had "turns" when he became semi-conscious, losing all sense of direction. These attacks lasted several seconds at a time, and occurred two or three times a day some days, leaving him free at other times for the best part of a week. He often wondered that he had never had an accident. I advised the patient to change his occupation when the chance arose. In September 1936 he became a cowman and has since remained absolutely fit.

CASE 2. W. G., aged 27, was talking in the office to his employer, a farmer, who noticed that he held the edge of the table for support. During the conversation the man dropped suddenly on to his knees, holding his head between his hands complaining of a bad head. His parents were used to his collapsing, and thought he had fits.

CASE 3. G. B., aged 22. had been a blacksmith and was perfectly healthy until he took up tractor driving. Within a week I attended him for vertigo and vomiting. Diet and rest soon enabled him to resume work, but anorexia and nausea continued for two months, when the job finished. This patient's history provided the clue to the mystery, and the cases quoted are typical of many others I have since been enabled to diagnose correctly.

CASE 4. E. M., age 26, had been a tractor driver for eight years. After five weeks he had epigastric pain and vomiting, headache and vertigo. Everything he vomited tasted of paraffin. He was driving a tractor with a " down " exhaust, and when he returned to work after five weeks, he undid the exhaust, swivelled it round, and replaced it so that the fumes shot out just in front of the back wheel. He has not been ill since, and is now driving a tractor with a vertical exhaust.

CASE 5. G. H., aged 36, drove a tractor in August, 1935, with a side exhaust. In October he developed gastritis, suffering from pain under the costal margins and vomiting. He was ill for three weeks. After a further three weeks at work he was again ill, and had to give up the job. He returned to the same work a year later and drove the same tractor, to which had been fitted a 2 ft. extension on the side exhaust. He drove it for two weeks. Then drove a brand-new tractor with a vertical exhaust, and kept fit until after seven months he was put on to drive an old tractor with a side exhaust. After five days he had epigastric discomfort, and two days later he had so much epigastric pain that he left work for a week, and then started lorry driving. He was later ordered to drive a five year-old tractor with side exhaust. He refused, and left the job. His employers put in a statement that they considered he left without due cause and was not entitled to unemployment benefit. I expressed an opinion that he had due cause to leave.

## PREVENTION

The prevention of tractor sickness, whether mild or severe, is simple, and rests with the manufacturers to fit vertical exhausts; and with farmers who own tractors to modify existing "down" or "side" exhausts and see that the engines are in good condition. The preventive measures outlined would soon be put into effect if any whole-time tractor driver consulting his doctor for definite and typical symptoms and signs of "tractor sickness" was given, not a National Health Insurance sickness certificate, but a "compensation" certificate.

# EDITORIAL

## SIR SQUIRE SPRIGGE

It is learned with very great regret as this issue goes to press that Sir Squire Sprigge, for thirty years editor of *The Lancet*, died at the end of his seventy-seventh year. He set a high standard for medical journalism and the ethical outlook of British medical journals was his constant concern. He sought to improve the relations between the public and the medical profession by an insistence that medical etiquette existed essentially for the smoother performance of the healing art. His life has been nobly spent in an important and essential part of professional organisation, and he will be remembered with gratitude and affection.

## NOTES AND QUERIES

Under this heading it is proposed to start a new feature in forthcoming issues of *The Practitioner*. Matters of medical interest upon which practitioners require information will be discussed. Readers are invited to send their queries to the Editor, and every endeavour will be made to secure information from experts in reply. Names of contributors to this section of *The Practitioner* will not be published if the senders of queries or of the answers so desire.

## METHOD OF GIVING REFERENCES

Starting with this issue *The Practitioner* is adopting the Harvard System of giving references to scientific literature. Numbered references in the text are not used and instead the author's name and the year of publication are given in brackets. When more than one paper by the same author is published in any one year each paper is distinguished by a small letter.

*Examples :—*

(1) According to a recent paper (Smith, 1936) it is alleged. . . .
(2) Jones and Robertson (1929) have stated that. . . .
(3) Brown in his original paper (1935a) said that the blood findings were normal but later (1935b) he modified this.

At the end of the paper references are not numbered but arranged alphabetically according to the author's name. Each reference must have author's name and initials (capitals); year of publication (in brackets); name of periodical (italics); volume number (Arabic numerals—bold face type); and paper (Arabic numerals—ordinary type). When a title of a book is referred to the place of publication, year of publication, number of edition and page should be given. The names of scientific periodicals should be abbreviated according to the *World List of Scientific Periodicals*.

# PRACTICAL NOTES

## THE USE OF CARBON DIOXIDE IN EARLY PNEUMONIA

**Lewis Gunther** and Harry H. Blond (*American Journal of the Medical Sciences*, April, 1937, cxciii, 525) urge that periodic inhalation of carbon dioxide is of value in the treatment of lobar and bronchopneumonia if used early enough. By its use, they claim, accumulation of exudate to the point of causing bronchial occlusion may be prevented; consolidation of the lung follows upon occlusion of the bronchus of drainage. Their figures, relating to small series, appear to show reduction of case mortality from 17 to 4 per cent. In patients not anoxic they advocate the use of carbon dioxide alone rather than mixed with oxygen; small, inexpensive, and easily transported cylinders can be used. A linen towel is folded in half, along its length. It is then wrapped around the patient's head and face from the chin to the vertex, so that a shallow cup is formed with the face as the base and the towel forming the sides. The end of a flexible rubber tube is held about two inches away from the patient's nose and the gas allowed to flow at the rate of about 3 litres a minute. Since carbon dioxide is 1½ times heavier than air it tends to accumulate in the cup. The gas is allowed to run until the patient develops a hyperpnœa which the observer can see is wholly out of voluntary control. The hyperpnœa is continued under the gas for about one minute when the administration is discontinued, but the towel around the face is not removed. The hyperpnœa continues for one or two minutes after the gas is stopped. The patient is then allowed to rest for five minutes, and a similar hyperpnœa is again induced. Two such periods of hyperpnœa constitute a treatment. This double inhalation is repeated at intervals of three hours during the waking hours and usually once or twice at night when the patient awakens. Administration is continued until the temperature becomes normal. During and after the administration of $CO_2$ the patient may cough severely and may bring up a surprising quantity of pus. Soon afterward he falls alseep, apparently in a state of exhaustion, but awakens later feeling definitely much better. In the authors' cases of lobar pneumonia treated with $CO_2$ the febrile period was 5·2 days as compared with 13·7 days in a comparable series of cases who did not receive this treatment.

## NEW USES FOR AUTO-HÆMOTHERAPY

**The** use of intramuscular injections of patients' blood taken from a vein in such conditions as urticaria is definitely established as of great value. K. Glombitza (*Deutsches Tuberkulose-Blatt*, March, 1937, xi, 65) reports on the value of auto-hæmotherapy in pulmonary tuberculosis with a difference from the usual technique, in that the blood is irradiated between in its passage from vein to muscle. The blood is irradiated by means of a special mercury vapour lamp with cooling adjustment and the usual plan of treatment has been as follows :—

For the first injection 2 c.cm. of blood irradiated for 15 seconds, repeated after three days. Provided that there is no reaction, the amount is increased to 3 c.cm. and the time of irradiation to 30 and then 40 seconds. After 5 injections, the irradiation time is increased to a maximum of 45 seconds and 3 c.cm. of blood is treated and injected every 3 to 4 days.

Beneficial results will generally be noticed after about 10 to 14 days and the treatment should not be carried on after 30 to 45 days if improvement is not found to have occurred. Another use for auto-hæmotherapy is described by Pasupati Rit (*Calcutta Medical Journal*, February, 1937, xxxii, 81) who has injected the patient's blood into the periphery of carbuncles. This he combines with glycerin-magnesium sulphate paste treatment and the blood injections are continued until the healing process is definitely established.

## PROPHYLAXIS OF WHOOPING COUGH

WHOOPING cough is an important disease among young children. The dangers from its complications warrant any effort to protect young children from becoming the victims of this infection. The unsatisfactoriness of measures used in the past stimulated F. M. Meader (*American Journal of Diseases of Children*, March, 1937, liii, 760) to make further inquiry into the matter of passive immunization by means of the blood serum of persons who have recovered from the disease. To measure the value of the method he observed comparable groups of treated and untreated children. It is important to realize that serum must not be expected to give protection after half of the incubation period has passed. Assuming that the average incubation period is twelve days, the serum must not be expected to protect those to whom it is given after the first six days. Again, the serum must not be expected to give protection for longer than three weeks. In his work 10 c.cm. of pooled blood serum from patients who had recovered from whooping cough was injected subcutaneously into the treated exposed children. From the experience derived from the untreated exposed group, 57 out of 94 treated exposed children should theoretically have developed whooping cough. Actually, whooping cough developed in only 16, so that 41 (57 minus 16), or 72 per cent., were apparently protected by the use of the convalescent serum. Meader states that for the physician who understands the precise use of convalescent whooping-cough serum and has an opportunity to use it skilfully, a considerable reward will be obtained. The most favourable results are secured with children in the first three years of life.

## PRONTOSIL IN DERMATOLOGY

THE value of prontosil in various infections of the skin is mentioned by H. Merz (*Schweizerische medizinische Wochenschrift*, April 17, 1937, lxvii, 342). In particular in the form of local applications for infections of the skin including facial acne and furunculosis this drug is stressed as being beneficial. Folliculitis can be treated by one to two tablets three times daily of prontosil by the mouth and in severe instances this can be combined with intramuscular injection. Merz, however, is particularly interested in the local application of prontosil by means of an ointment. The tablets of prontosil album are dissolved in water, filtered and the resulting solution worked into a 10 per cent. ointment using as a medium some preparation which is as free of fat as possible. With this ointment it is claimed that acne, furunculosis, and impetigo can be quickly and pleasantly eliminated. The ointment is quite free from odour and irritation and can be combined if necessary, with more prontosil internally.

## BLOOD TRANSFUSION: A CLOSED METHOD OF COLLECTION AND ADMINISTRATION

THE prevention of infection of the blood and the exclusion of small clots from the blood stream are the objects of transfusion apparatus devised by W. H. Milroy and A. D. Matheson (*Medical Journal of Australia*, March 6, 1937, i, 366). The apparatus as used for collection and administration respectively is shown in figures 1 and 2. Possibility of infection of the blood is rendered unlikely in that the method is a closed one and the blood remains in the same flask throughout. Small clots which may happen to form in the collected blood are excluded from passing into the recipient by the barrier offered by a double layer of best quality fine gauze which is tied over the bulb of the thistle funnel. During collection of the blood the stem of the funnel is closed by a rubber cap (F); this cap is transferred to the tube (A) during administration of the blood. Moderate suction during collection is provided by the reversed Higginson's syringe. Before the needle is introduced into the donor, some 3·8 per cent. sodium citrate solution is aspirated into the flask (50 c.cm. per pint of blood). The donor's vein is kept engorged by the opposition offered to the venous return by a sphygmomanometer cuff, inflated to a pressure of 60 mm. Hg, around his arm. During administration of the blood which has been collected, the flask is supported in a shallow metal pan (E) at a height of about 60 cm., above the recipient's vein. Either a needle or cannula is used and is connected to the thistle funnel by tubing which contains a dropper. This dropper consists of the barrel of an ordinary male urethral syringe fitted with a rubber stopper (H, figure 2), through which passes a piece of glass tube.

During insertion of the needle or cannula the stopper is disconnected and the dropper and tubing filled with sterile normal saline. When the saline solution is running freely into the vein, the stopper is pushed into position so that the system becomes air-tight. The saline continues to flow and causes the blood to siphon. The rate of flow can then be regulated by the screw clip (C).

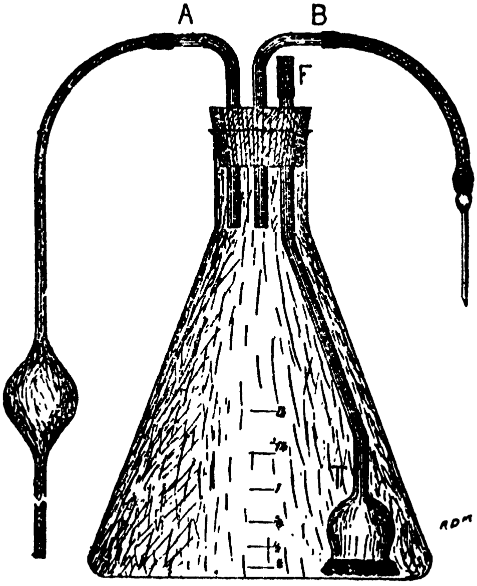

FIG. 1.

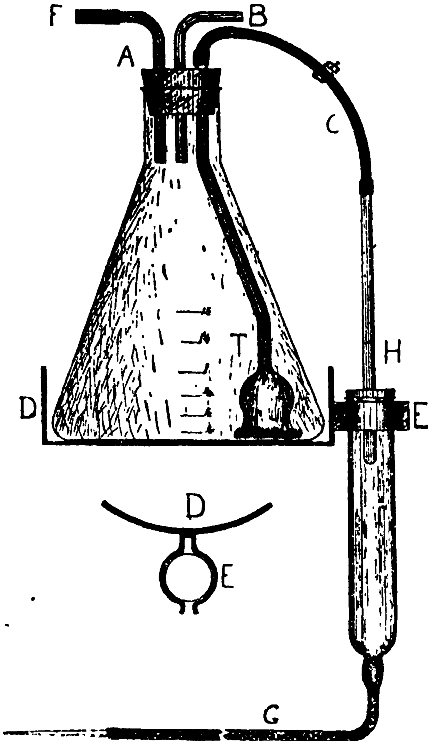

FIG. 2.

## THE ASCHHEIM-ZONDEK TEST AND CEREBRAL TUMOURS.

THE Aschheim-Zondek reaction which is now so well established in the diagnosis of pregnancy is known to depend essentially upon functional alterations in the pituitary gland. M. Monnier (*Presse médicale*, March 17, 1937, xlv, 412) pointing out that the pituitary in its function may be influenced by the state of the surrounding cerebral tissue, has applied the Aschheim-Zondek reaction in the diagnosis of cerebral tumours. The patient's urine has been utilized just as with the pregnancy test. Positive results have been obtained, notably when the tumours were in the neighbourhood of the third ventricle or in the frontal lobes, but even in certain cases, when the tumour was situated much further away from the pituitary, namely in the cerebellum, it is claimed that changes in the experimental animals could be recognized after an injection of the patient's urine, even although, strictly speaking, the Aschheim-Zondek reaction is negative. Various investigations have shown that the cerebrospinal fluid obtained either from lumbar or ventricular puncture contains no more hormone than the urine, so that from the technical point of view, urinary tests are sufficient. Certain patients with other intracranial lesions such as encephalitis or abscess have been investigated, but the results have been for the most part negative.

## OPTOCHIN IN THE TREATMENT OF PNEUMONIA

The modern developments of serum therapy have to some extent obscured the claims made for other special methods of treating pneumococcal infections. J. von Szenti (*Münchener medizinische Wochenschrift*, April 16, 1937, lxxxiv, 615) has recently analyzed his results of fifteen years' experience of treating pneumonia and he strongly emphasizes the value of optochin. Among 195 examples of croupous pneumonia there have only been six deaths and this he attributes to the use of optochin which has also reduced the number of complications and also, apparently, the usually expected length of the disease process. The optochin is given for eight doses at two-hourly intervals, the amount of each dose varying from 2 cgm for a child of a year old to 10 cgm. for an adult. No other special treatment is used with the exception of occasional cardiac stimulants, and for the most part a definite improvement appears on the third day after the beginning of treatment. From the published records, it is clear that the treatment is well tolerated, even by young children and the general course of the clinical process has appeared to be very satisfactory.

## ALKALOID TREATMENT OF THE COMMON COLD

Originating, it is believed, a few years ago in America the medicinal treatment of the "common cold" by certain powerful alkaloids receives support from F. Hutter (*Wiener klinische Wochenschrift*, March 19, 1937, i, 376). The drugs employed consist of codeine and papaverine, ½ gr. of each and this is taken fives times daily for two days immediately the "cold" threatens. No other measures are taken and the method is only effective for the true "common cold." The American authors claimed 75 per cent. of successes in aborting the "cold" by this means, but the present author believes his own results to be even better. The underlying explanation of this method is not clear, but careful control experimentally indicates that other drugs, even of a similar opiate nature, are not nearly so effective. Hutter suggests that the method should be given a full trial, particularly among babies and young children for whom a "cold" may even prove fatal. The dosage would, of course, have to be very carefully regulated in young subjects.

# REVIEWS OF BOOKS

*Trauma and Disease.* Edited by L. Brahdy, B.S., M.D., and S. Kahn, B.S., M.D. London : Henry Kimpton, 1937. Pp. 613. Illustrated. Price. 35*s*.

Dr. L. Brahdy is the physician-in-charge of industrial diseases and accidents in the office of the Corporation Counsel of the City of New York; Dr. S. Kahn is a medical examiner in the Bureau of Workmen's Compensation of the Department of Labor, State of New York and they have secured the help of twenty-two contributors, many of whom have a world wide reputation such as Cabot, Crohn, Joslin, Pemberton and Paul White. The result is a most important and authoritative work upon the whole difficult question of the part played by injury in its broadest sense in the subsequent development of disease. An introductory chapter by the editors is a brilliant summary of the general aspects of the subject and thereafter the specialized points of view are put in relation for the most part to regional or general disorders. Practitioners concerned in workmen's compensation cases should find this a valuable work of reference and extensive bibliographies at the end of the chapters offer a wide view of the literature for those requiring further information. This is an excellent example of how a gap in medical literature can be brilliantly filled by a well-chosen team of collaborators.

*Chronic Miliary Tuberculosis.* By Clifford Hoyle, M.D., M.R.C.P., and Michael Vaizey, M.B., M.R.C.P. Oxford University Press. London : Humphrey Milford, 1937. Pp. ix and 140. Illustrations, 18. Price 12*s*. 6*d*.

This is a well-written monograph based on eight personal observations and a hundred and ten selected recorded cases collected since 1914 which are abstracted and occupy one quarter of the text. The term chronic miliary tuberculosis was employed in 1910 by Adami and Nicholls, the French *granulie froide* is a synonym, and isolated recoveries from acute generalized tuberculosis were recorded more than seventy years ago. The cases run a course of more than three months and thus are distinguished from the acute form. The morbid anatomy and the clinical features are carefully analyzed, and three clinical forms are described: (i) resembling the acute form and proving fatal in less than six months, (ii) running a course of more than six months, often with intermissions, and proving fatal, frequently from acute tuberculous meningitis and general tuberculous toxæmia, and (iii) those in which the disease is arrested, sometimes permanently. The treatment is summarized, and there is a bibliography of more than 200 items.

*Diagnosis and Non-Operative Treatment of the Diseases of the Colon and Rectum.* By Gottwald Schwarz, M.D., Jacques Goldberger, M.D., and Charles Crocker, M.D. London : H. K. Lewis & Co., 1937. Pp. x and 540 with 246 Illustrations and 9 Coloured Plates. Price 40*s*.

More than one-quarter of this well-illustrated book is devoted to the modern technique in X-ray examination of the colon and rectum. This portion of the book is of great value and importance. All the various recent advances in technique and diagnosis are well described. The authors rightly stress the importance of recto-sigmoidoscopy and state that this method is becoming a procedure of general practice. A detailed description is given of a Deplicoptic sigmoidoscope, the irrigating system and optical arrangement of which can only unnecessarily complicate the simple and safe method of signoidoscopy by any of the well-known instruments which afford sufficient magnification. The treatment of diarrhœa and the medical treatment of colitis is ably dealt with, though it is surprising to see an illustration of the Higginson syringe among the various apparatus recommended for colonic irrigation. The dangers of this instrument are well recognized. The authors deal thoroughly with all the methods of non-surgical treatment and it is interesting to note that X-rays are recommended for condylomas of the anus, peri-rectal abscesses and tuberculous anal fistulæ. The use of basic procaine and butesin in oil is not mentioned in the treatment of pruritus or fissure-in-ano. The injection treatment of hæmorrhoids is considered as radical and one of the contra-indications to injection treatment is said to be severe hæmorrhage.

*Diseases of the Newborn.* By A. Tow, M.D. Oxford University Press. London: Humphrey Milford, 1937. Pp. viii and 477. Figures 53. Price 27*s.* 6*d.*

The recent increasing interest in the case of the newborn baby is reflected in this book. The author has had wide opportunities for observation at the New York Polyclinic Hospital and when a subject is still a matter of controversy he has not hesitated in expressing a personal view. The result is a happy combination of critical commentary on existing literature, accurate observation and practical knowledge. After chapters dealing with general considerations, infant feeding, the premature infant and birth injuries, the book continues to cover the various systems. The short sections dealing with artificial feeding err on the side of simplicity as well as brevity but this is perhaps all to the good in view of the greater detail given in relation to breast feeding. Recent work on asphyxia neonatorum is well summarized and the supreme value of "oxygen and oxygen alone" is rightly stressed. This is a textbook which practitioners should find very helpful.

*The Diagnosis and Treatment of Diseases of the Liver and Biliary Tract.* By John Phillips, M.B. Revised by Russell L. Haden, M.D. Oxford University Press. London: Humphrey Milford, 1936. Pp. viii and 539. Illustrations 56. Price 32s. 6d.

This monograph in the series edited by Professor Henry A. Christian of the Bent Brigham Hospital, Boston, was originally written by Dr. Phillips who met his death in the disastrous fire of X-rays films at the Cleveland Clinic in 1929, and has been revised by his successor at the Clinic. This work deals in a thorough but concisely expressed manner with the diseases, in separate sections, of the liver, the extra-hepatic bile-ducts, and the gall-bladder. The volume opens with a useful consideration of the anatomy, physiology, methods of examination, and functional tests of hepatic function. In this introductory section there is an interesting account of the method of cholecystography employed at the Clinic, which gave correct diagnoses in 93 per cent. of the cases examined by the single-dose oral method. The description of the van den Bergh reaction is usefully illustrated by two coloured plates showing the changes in the colour of the blood serum in the direct and indirect results. The section of diseases of the liver, occupying 300 pages, contains a full discussion of jaundice and of the treatment of the various forms. Gall-stone disease is considered with other affections of the gall-bladder, and a guarded opinion is expressed about the value of Lyon's non-surgical drainage of the gall-bladder in cholecystitis. It is pointed out that the first operation on the gall-bladder, undertaken for a supposed ovarian cyst, was performed in 1867 by Bobbs of Indianapolis. The book is copiously documented and the illustrations, especially the eight in colour, are admirable.

*Prognosis.* Volume Two. Published by *The Lancet* Limited, London, 1937. Pp. xx and 410. Price 10*s.* 6*d.*

JUST two years ago the first collection of specially contributed articles to *The Lancet* on the prognostic aspects of medicine was published and here in a second collection are the views of over sixty experts on a further group of disorders. It is pointed out that patients are probably more interested in prognosis than anything else even if the essential questions—"shall I get better?" "when shall I be fit for work?"—are not always formulated. The answers framed here are on a broad basis and take into consideration all the factors concerned.

*Immortal Names and other Poems.* By T. WILSON PARRY, M.A., M.D., F.S.A. London : The Mitre Press, 1937. Pp. 122. Price 5*s.*

THE author, also well known for his investigations on pre-historic trephining, has collected his verses of which the first series—Immortal Names—begins with verses about Æsculapius and Homer and includes others on Hippocrates, Harvey, Hunter, Keats, Darwin, and Lister. Other verses are grouped under "travel sketches," "the quest eternal," "miscellaneous," and "trifles (mostly medicated)"; the last and the longest of the 78 poems is on "Surgery in the Stone Age (a Ballad of Neolithic Times)". The contents of this tastfully produced volume impress the reader with the wide sympathies and knowledge of the author.

## NEW EDITIONS

THE fifteenth edition of *Rose and Carless Manual of Surgery* by C. P. G. WAKELEY, D.SC., F.R.C.S., and J. B. HUNTER, M.CH., F.R.C.S., (Baillière, Tindall and Cox, 30*s.*), appears exactly thirty-nine years since this popular manual was first published and the present version, in two volumes, is issued as a "coronation edition". It probably contains more important changes than any previous edition and in spite of the skilful editing of its authors the text is longer by 130 pages—due partly to the addition of 242 illustrations bringing the number of these now to nearly a thousand. Many experts have been called on to deal with specialist surgery and the whole product is a worthy representation of the London school of surgery.

*Tweedy's Practical Obstetrics* by B. SOLOMONS, M.D., F.R.C.P.I., F.C.O.G., and N. M. FALKINER, M.D., F.R.C.P.I., F.C.O.G., in its seventh edition (Humphrey Milford, Oxford University Press, 25*s*.), contains much new material including a very complete section on the care of the infant by Dr. R. E. Steen. Dr. Falkiner has assisted Dr. Solomons in this version and, while the general arrangements of the subject matter remains much the same as in the previous edition, there is evidence of wholesale revision and rewriting in order to fulfil modern requirements.

*Common Skin Diseases* by A. C. ROXBURGH, M.A., M.D., F.R.C.P., gained an easy popularity when first issued as a member of the "General Practice Series" and, in its fourth edition (H. K. Lewis & Co., Ltd., 15*s*.), just over four years since it first appeared, will continue to be a safe, clear and thoroughly practical guide to this branch of medicine. Certain changes in the text and in the illustrations have been made in keeping with modern work.

*Hale-White's Materia Medica* revised by A. H. DOUTHWAITE, M.D., F.R.C.P., for its twenty-third edition (J. & A. Churchill, 10*s*. 6*d*.), has achieved the distinction of reaching its 115th thousand. The recent Addendum (1936) to the British Pharmacopœia has necessitated certain official changes and it is gratifying to note how many of the other alterations made in this edition are the result of clinical investigations by British physicians.

*The Diabetic Life* by R. D. LAWRENCE, M.D., F.R.C.P., has appeared in a new edition nearly every year since it was first published, a testimony not only to the advances made in the subject but to the conscientiousness of the author in seeking to make these advances speedily available in a practical form for general practitioners. The tenth edition (J. & A. Churchill, Ltd., 8*s*. 6*d*.), is notable chiefly for the account contained of the methods of using protamine insulin.

*Favourite Prescriptions* by ESPINE WARD, M.D., is now issued in a fourth edition (J. & A. Churchill, Ltd., 7*s*. 6*d*.), The main changes have been caused by the B.P. Addendum (1936) and in addition the formulæ for children have been largely extended. Diet tables and notes on the treatment of poisoning add to the value of this modest volume which contains a vast amount of useful information.

It is nearly thirty years since *Mental Deficiency*, by A. F. TREADGOLD, M.D., F.R.C.P., F.R.S.E. (Baillière, Tindall & Cox, 25s.) first appeared and now in its sixth edition it has been copiously revised in order to keep pace with the modern developments of what has now come to be regarded as a major social problem. This volume needs no introduction for it is well-recognized as a standard textbook. A new section on the chronological development of the normal mind is a useful addition.

# NOTES AND PREPARATIONS

## SOCIETY FOR RELIEF OF WIDOWS AND ORPHANS OF MEDICAL MEN

At a recent annual meeting of this Society, it was announced that the year 1936 had seen the largest number of widows dependent on relief from the Society at any one time since its foundation in 1788. The total membership of the Society is 275 and this is open to medical men who at the time of their admission are resident within a radius of 20 miles from Charing Cross. For a subscription of two guineas (from members admitted before 35 years of age) a newly-married man obtains guarantee that his wife and young children will, in the event of his early death, not be left unprovided. When success in practice enables a member to make provision for his dependents his subscriptions are of a benevolent nature. Full particulars and application forms may be obtained from the Secretary, 11, Chandos Street, Cavendish Square, London, W.1.

## NEW PREPARATIONS

**Examen.**—This is a new liver extract in highly concentrated form, available for parenteral injection. Each 2 c.cm. ampoule contains only 10–15 mgm. of solids, representing 100 gm. of fresh liver. It is claimed that the maintenance dose in cases of pernicious anæmia is only 2 c.cm. every fortnight. Examen is prepared by the Glaxo Laboratories, Ltd., Greenford, Middlesex, and is supplied in boxes of three ampoules (each of 2 c.cm.) at 13*s.* 4*d.* or six ampoules at 25*s.* Injections are said to be painless and in emergencies it may be used intravenously.

**Lemon Barley Powder.**—A new form of this useful beverage is now available in a powder which is simply dissolved in cold water to be ready for use. This has obvious conveniences and the sample supplied produced a very pleasant drink. For sick-room use and as a refreshing drink in hot weather lemon barley water has much to recommend it. This new tinned variety is prepared by George Borwick & Sons, Chiswell Street, London, E.C.1, and is sold in three sizes—8 oz. at 10½d., 12 oz. at 1s. 3d., and 24 oz. at 2s. 3d. Larger sizes are available suitable for hospital use.

**Seedlax.**—This is a combination of seeds mixed with wheat germ which is claimed to act as a laxative in virtue of lubricant properties and the presence of vitamin B. The recommended dose is two teaspoonfuls daily before meals, followed by a glass of water, or alternatively the required quantity may be sprinkled over breakfast cereals. This is a Canadian product and is obtainable in tins costing 2*s.* 6*d.* The agents in this country are the Seedlax Company, 107/8, Upper Thames Street, London, E.C.4.

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L I B R

# IMMUNIZATION AGAINST DISEASES IN THE TROPICS

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MANY of the diseases now regarded as essentially tropical were at one time widely distributed in more temperate lands, whence they have been driven by hygienic and sanitary measures for the most part lacking in the tropics. The preservation of health in tropical countries thus depends largely on individual prophylaxis against disease and among such measures of prophylaxis must be placed active immunization. Unfortunately, since no true immunity exists against protozoal diseases, immunization against malaria or sleeping sickness is impossible, although chemo-prophylaxis is now possible with the aid of such synthetic drugs as atebrin and plasmoquine and Bayer 205. In one respect immuno-prophylaxis resembles chemo-prophylaxis, for immunity can now be induced, according to Boivin, Mesrobeanu and Mesrobeanu (1933) by the injection of bacterial fractions of constant chemical composition. It is therefore not impossible that in the future synthetic compounds will be prepared which, unlike atebrin, plasmoquine or Bayer 205, will be capable of causing the production of immune bodies. For the present, however, immuno-prophylaxis consists in the injection of either the products of the organisms, or more often the organisms themselves after they have been attenuated or killed.

## IMMUNIZATION AGAINST BACTERIAL DISEASES

The bacterial diseases of the tropics against which immunity may be produced are typhoid and the paratyphoid infections, cholera, plague and, less satisfactorily, bacillary dysentery. Although prophylactic immunization against cerebrospinal meningitis, now one of the major health problems of tropical Africa, has been attempted, there is little or no evidence of its efficacy.

*Typhoid and paratyphoid fevers.*—The value of antityphoid inoculation is now hardly in dispute, in view of the impressive figures collected by the Antityphoid Committee (Report 1913) in regard to the incidence of typhoid fever among inoculated and non-inoculated troops stationed abroad. These figures, analysed statistically by Greenwood and Yule (1915), show very strikingly the value of prophylactic immunization. During the war so great a proportion of troops was immunized that it is difficult, if not impossible, to compare the incidence in immunes and non-immunes, although the presumptive evidence is strongly in favour of the value of immunization. In France, however, a comparison has recently been made by the Ministers of Marine and War (1936) of the incidence of typhoid among the civilian and military populations for the periods 1901–1913 and 1920–1932. When all due allowance is made for better hygienic conditions in the services, it would seem that the greatly decreased incidence among the naval and military personnel as compared with the civilian population can only be attributed to prophylactic immunization.

Although inoculation against typhoid and paratyphoid was antedated by anticholera inoculation more advance has been made in immunization against these diseases than against any other bacterial infections. This is largely due to the intensive study of the antigenic structure of the organisms of the typhoid - paratyphoid group which has been carried on during the past few years. Although the importance of using only smooth strains in the preparation of vaccines had been realized for some time, it was not appreciated that smooth strains themselves vary greatly in their immunizing capacity (Grinnell 1932), and that in addition to complete smoothness, organisms used for vaccines should possess maximum virulence for suitable laboratory animals (Perry, Findlay and Bensted, 1933 and 1934), that is they should contain the Vi (virulence) antigen isolated by Felix and Pitt (1934). Recently Topley and his colleagues (1937) have shown that in mice a very high degree of immunity can be obtained by inoculation with a protein fraction of constant chemical composition obtained from the bodies of typhoid bacteria. The way is thus opened for the synthetic preparation of chemical compounds which will act as effective antigenic agents.

The vaccine now used (T.A.B.) contains *Bacillus typhosus* 1,000 million organisms per c.cm., and *B.paratyphosus* A and B (each 750 million per c.cm.). Two injections are usually given but if unpleasant reactions are to be avoided it is preferable to give three doses at weekly intervals, an average dose being 0·1 c.cm., 0·5 c.cm. and 0·75 c.cm. If possible the patient should be vaccinated in the evening before going to bed, and should be instructed to avoid alcohol in particular, and active work for from twenty-four to forty-eight hours after inoculation. Apart from a short and variable febrile reaction there may be some local swelling and redness at the sites of injection. For those exposed to infection continuously, it is advisable to have re-inoculation with one or two doses at intervals of eighteen months to two years. *B. paratyphosus* C is rarely incorporated in the T.A.B. vaccine, but not infrequently for those going to India *Vibrio choleræ* is added.

During recent years various attempts have been made to induce immunity against typhoid and paratyphoid by the oral administration of typhoid vaccine, but so far the results are not encouraging. The possibility of using typhoid endotoxins has, however, been tested (Grasset and Lewin 1936; de Villiers 1937).

*Cholera.*—The first attempt to immunize human beings against cholera was made in Spain by Ferran in 1885: small doses of a living broth culture were injected subcutaneously, but so severe were the local and general reactions that the Government forbade the continuance of the experiments. The cholera vaccine now used is one prepared on the lines laid down by Kolle (1896) who used vibrios killed either by chloroform vapour or by heating at 55° C. for one hour, with the addition of 0·5 per cent. of phenol as a preservative. Haffkine (1895) had previously used living vaccines, a first inoculation of vibrios attenuated by prolonged cultivation being sometimes, though not invariably, followed by the injection of vibrios the virulence of which had been increased by repeated passage in the peritoneal cavities of guinea-pigs. Later Haffkine (1911 and 1913) abandoned the use of living organisms and used a vaccine in which the vibrios had been killed by heating at 50° C. for a few minutes, 0·5 per cent. phenol being added as in Kolle's vaccine. Vaccines containing dead organisms are now used exclusively. Their exact value is not easily assessed and the immunity conferred probably does not last for more than a year. Greenwood and Yule (1915), however, as the result of a careful statistical examination of certain figures concluded that anticholera inoculation was of prophylactic importance, since the probability that the difference in the attack rates between immunized and non-immunized was due to chance was much less than 1 in 10,000.

Re-inoculation should be carried out at intervals of six months. The full immune titre is not reached till the eighth day after inoculation, though a considerable degree of protection can be assumed to have been obtained by the sixth day (Taylor, Ahuja and Singh, 1936). In preparing vaccine it is important to employ strains which show both "H" and "O" agglutination and also have the particular chemical structure characteristic of Linton's chemical groups I and II.

*Plague.*—In India and the Far East a vaccine against plague has been in use for many years. Small rodents, such as mice, rats and rabbits, were immunized by Yersin and his co-workers as long ago as 1895, but guinea-pigs are more difficult to protect. Both attenuated living bacilli and bacilli killed by heat have been employed. Sokhey and Maurice (1937) point out that the temperature at which the organisms are killed is of considerable importance. Exposure to 55° C. for fifteen minutes, as in Haffkine's original vaccine, produces a satisfactory antigen, but exposures at 60° to 70° C. for one to two hours destroys the immunizing power. According to Kurauchi and Homma (1936) a specific immunizing fraction can be isolated from the bacilli: this fraction which is of constant chemical composition is capable of immunizing against infection. The inoculation of antiplague vaccine sometimes produces severe reaction with fever and tenderness in the superficial lymph nodes.

As in so many other instances exact statistical figures of the value of the vaccine are not easily obtained; de Vogel (1937), however, reported that in Java, among 37,435 persons injected with a non-virulent living vaccine, 38 or 1·01 per thousand died of the disease, while of 39,483 persons who were not immunized, 200 or 5·05 per thousand died. In Madagascar, Girard and Robic (1936) also found a reduction in mortality, for among 46,800 natives immunized, the death rate from plague was only two-thirds that of the 59,200 controls.

*Bacillary dysentery.*—Although immunization against typhoid and paratyphoid fevers has been attended with success, many difficulties have had to be faced in the use of bacillary dysentery vaccines. These difficulties are in part due to the large number of types of bacillary dysentery, in part to the great toxicity of the bacilli. Even small doses of bacilli produce a severe reaction that may last for several days. Numerous efforts have been made to decrease toxicity by physical or chemical means. Olitsky (1918) recommended the use of heat-killed bacilli suspended in neutral olive oil, and Shiga (1903) used a mixture of potent immune serum and killed organisms. The first dose contains 0·1 c.cm. of immune serum mixed with 500 million killed Shiga bacilli, the second dose, given ten days later, contains 1,000 million organisms and 0·2 c.cm. of serum. The morbidity rate is said to have been approximately the same in the inoculated and uninoculated, but the mortality rate was considerably decreased.

Besredka (1927) produced a " bili-vaccine" consisting of dead bacilli with the addition of bile. On three successive days before breakfast a dose of bile is given by mouth and this is followed by one hundred thousand million bacilli killed by heat. Excellent results have been claimed by French workers, but the statistics available are not yet conclusive. In Japan, Iguchi, Ohstubo and Eguchi (1933) have also tried oral administration with pills prepared from three local strains; the morbidity, but not the mortality, is said to have been decreased.

Finally, Dumas, Ramon and Bilal (1926) have suggested the use of an anatoxin, a formolized toxin prepared in the same way as diphtheria anatoxin or toxoid. Bouffard and Vaucel (1933) and van Riel and Pergher (1935) have used this anatoxin in the Belgian Congo with considerable success. It is thus obvious that no finality has yet been obtained in the preparation of a satisfactory means of immunization against bacillary dysentery.

### IMMUNIZATION AGAINST DISEASES CAUSED BY RICKETTSIA

It is now realized that, in addition to the classical epidemic typhus transmitted by the body louse, there are a number of other endemic typhus-like diseases caused by Rickettsia and transmitted by rat fleas, ticks or mites. Both the epidemic louse-borne typhus and the various forms of endemic typhus are widely distributed in the tropics and sub-tropics where some forms such as Rocky mountain spotted fever may cause a high mortality.

Immunization against epidemic and endemic typhus is now carried out with a vaccine prepared either by the method of Zinsser and Castaneda (1932) or by the technique suggested by Weigl (1924). The first method consists in exposing rats to X-rays whereby their resistance is reduced, inoculating them intraperitoneally with Rickettsiæ and obtaining the peritoneal exudate. Weigl's method consists in the artificial infection of lice by way of the anus; the Rickettsiæ then multiply in the intestinal canal, which can be removed from the lice. This louse vaccine has been used in Poland (Weigl 1933) where of 2,755 immunized none contracted typhus, although constantly exposed to infection. The vaccine, comprising material from 200 lice, is injected subcutaneously in three doses at weekly intervals. A slight local reaction is produced and occasionally the local lymph nodes are enlarged, but there is practically no general febrile reaction. The rat vaccine has been used in Mexico where, it is said, over 8,000 persons have been successfully immunized and epidemics successfully combated.

In the case of Rocky mountain spotted fever a vaccine is prepared from the tissues of virus-infected Rocky mountain wood ticks (*Dermacentor andersoni*) with the addition of either 2 per cent. phenol or the same percentage of a phenol-formalin mixture. Immunization has been in use since 1925 and some 24,000 vaccinations have been carried out. According to

Parker (1935) the vaccine has a definite value, the degree and duration of protection varying with the individual and with the degree of virulence of the infecting strain of Rickettsia.

### IMMUNIZATION AGAINST VIRUS DISEASES

Immunization can now be successfully carried out against smallpox, rabies and yellow fever, while in the domain of veterinary medicine it is possible to protect against rinderpest (cattle plague) and African horse sickness. Although comparatively little is yet known of the true nature of viruses, immunization against virus infections antedates all other forms of immunization. The ancient Chinese protected themselves against smallpox by sniffing up the nose a mixture of dried scabs and essential oils, and in Africa and India inoculation of the skin of healthy persons with smallpox material was carried on for centuries before Lady Mary Wortley-Montague introduced the practice from Constantinople into England.

Virulent *smallpox* is now rarely seen in England, its place having been taken by the mild smallpox known as variola minor, or alastrim. In the tropics both alastrim and virulent smallpox still flourish and the latter is still a fatal disease against which vaccination is the only certain protection. Within the last few years the possibilities of using vaccinia virus grown in tissue culture have greatly simplified the preparation of a bacteria-free virus. Vaccinia can now be grown either *in vivo* on the chorio-allantoic membrane of the developing chick embryo, or *in vitro* in a serum-Tyrode medium containing small amounts of minced chick embryo.

Immunization against *rabies* was introduced more than fifty years ago by Pasteur and the technique which he employed has, with slight modifications only, been continued to the present day. The method consists essentially in producing a variant of the ordinary rabies virus by repeated passage through the brains of rabbits. By this means the ordinary or "street" virus becomes converted into a "fixed" virus and so attenuated that when injected subcutaneously in animals or man it does not travel up the peripheral nerves to the central nervous system. Nevertheless, it produces a rapid immunity against both the fixed and the street virus. Pasteur himself used the dried spinal cords of rabbits infected with the fixed virus, but later workers, notably Fermi and Semple, found that brain or spinal cord treated with 0·5 c.cm. of phenol retained their immunizing power. More recently it has been shown that although the virus may be killed by the phenol, the dead virus is still antigenic. Rabies virus thus resembles that of influenza, but differs from vaccinia and yellow fever, in that killed virus in small amounts is capable of producing immunity. The possibility of employing killed virus was, according to Remlinger and Bailly (1936), foreseen by Pasteur himself and is obviously less dangerous than the use of living virus. It appears that both fatal and non-fatal paralytic accidents are relatively infrequent amongst persons treated by phenol killed, ether killed and heated vaccines, but both fatal and non-fatal accidents are relatively frequent amongst those treated by Fermi's original vaccine in which the virus is probably not killed. The exact technique and dosage of the injections depends on the method of preparing the spinal cords and whether the cords are used fresh, attenuated by heat or drying, or after the addition of phenol or glycerin.

Provided immunization can be carried out shortly after the infecting bite a high degree of protection can be assured, though a recent statistical survey by McKendrick (1937) suggests that there is little to choose between the various methods so far as the production of immunity is concerned.

Unlike immunization against smallpox and rabies inoculation against *yellow fever* is of comparatively recent introduction and only followed the discovery by Stokes, Bauer and Hudson (1928) that the rhesus monkey is susceptible to yellow fever. Various attempts were at first made to use an emulsion of infected monkey liver treated with formalin, phenol or chloroform. These vaccines although possessing some immunizing power were capable of giving rise to ordinary yellow fever or, if kept too long, failed to immunize. This failure to immunize is due to the fact that killed yellow fever virus is capable of producing immunity only when it is injected in very large amounts (Findlay and Mackenzie 1936). It was in fact only when Theiler (1930) had shown the possibility of producing neurotropic strains of yellow fever virus that immunization could be successfully undertaken. The neurotropic strain was produced by repeated passage in the brains of mice, animals which are not normally susceptible to ordinary yellow fever, but, nevertheless, die with encephalitis when the virus is injected directly into the brain. Owing to the danger of producing encephalitis in man the injection of the neurotropic virus has always been accompanied, in the hands of British and American workers, with immune yellow fever serum. In France, however, a number of persons have been inoculated with the neurotropic strain of yellow fever virus without serum and as a result a number of cases of meningo-encephalitis have occurred.

The use of the neurotropic virus has now been largely replaced by an ordinary yellow fever virus, which as a result of more than two hundred passages in tissue culture, has become so attenuated that it is no longer pathogenic for monkeys, although it still retains its antigenicity. At first the injection of the attenuated tissue-culture virus was accompanied by the inoculation of yellow fever immune serum, but more recently the attenuated virus has been given alone, without causing any serious reactions (Findlay and MacCallum, 1937). The immunity conferred lasts certainly for two or three years and in some instances considerably longer. Fortunately all strains of yellow fever virus appear to cross-immunize, but this is not true of some other virus infections such as horse sickness, a fatal disease which in certain parts of Africa entirely prevents the keeping of horses. In this disease there are at least six strains which are antigenically distinct and thus, though neurotropic variants have been produced on the lines of the neurotropic yellow fever virus, it is necessary in this disease to inject a polyvalent vaccine. In Rift Valley fever, a disease of East Africa attacking men, sheep and cattle, a neurotropic variant has also been produced and gives promise of being of prophylactic use.

It will thus be seen that whether diseases are due to bacteria, Rickettsiæ, or viruses the principles of immunization are the same and involve the use of organisms either killed or so attenuated as to be of greatly reduced pathogenicity. The methods initiated by Jenner and Pasteur thus continue to be of value in the prophylaxis of diseases in whatever part of the world they may occur.

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# INVESTIGATION OF CASES OF OBSCURE FEVER

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COMPLETE elucidation of a fever in which few suggestive signs or stigmata present themselves to the investigator may be a task of considerable severity, so that to compile an exhaustive list of the possible causes of pyrexia would almost cover the whole range of a modern medical textbook, as the diagnosis may be as diverse as is the Pole to the Antipodes, and may comprise anything from carcinoma to hysteria. It is necessary to define precisely what is meant by "obscure fevers"; by this it is inferred that only those fevers are included in which the diagnosis is by no means at first obvious, and that this definition excludes the commoner exanthemata.

The investigations which are necessary may be numerous and complicated, and it is usually impossible to bring them all to the aid of the diagnostician. It is a task which calls for considerable intuition, and one which demands the perspicacity of a Sherlock Holmes with the imagination of a Defoe, as a consultant is often importuned to give a decisive opinion on a long and obscure fever based on a confused and often inadequate history without the assistance of any helpful laboratory data.

The procedure preliminary to diagnosis entails a careful history, together with a description of the patient's various aches and pains, headaches, abdominal sensations, rigors, jaundice, urinary symptoms, cough, and night sweats.

In women, it is usually necessary to inquire into the previous catamenial history, because pregnancy may be accompanied by fever, or the cause may be purely gynæcological. It is most important that a survey should be made of the patient's previous movements. The country of origin of the illness is usually suggestive, and a recent visit to the tropics may indicate the probable cause or causes.

The complete diagnostician must therefore possess more than a fleeting knowledge of tropical medicine. In Central Africa alone is found the trypanosome, a truly tropical parasite which is not infrequently the cause of an obscure and irregular pyrexia. India, Central China, the Sudan and the Mediterranean are the homes of kala-azar, which may give rise to obscure and irregular fever. Amœbiasis, which may also produce prolonged or intermittent fever, is widespread throughout the tropics and subtropics. Amœbic infection, when confined to the bowel, may be accompanied by pyrexial attacks, but more usually so when the liver is invaded, as in amœbic hepatitis and hepatic abscess. Undulant or Malta fever still crops up in most tropical countries, while its subvariety of the abortus type is not uncommonly to be found nearer home. Malaria is an ever-abiding puzzle. *B.coli* infections of the urinary tract are by no means uncommon, and may produce either rigors with high pyrexia or a long drawn-out fever of an irregular type.

The habits and previous history of the patient may also be suggestive. A history of syphilitic infection would indicate a possible gumma; gonorrhœa, some infection of the bladder or kidney; a history of tuberculous adenitis; some hidden tuberculous focus. In addition, deposits of malignant disease should never be overlooked as a cause of obscure fever. The influence of mind over the body is not infrequently observed in hysterical persons, as well as in young children, in whom a spurious fever may be induced by mental, as apart from somatic, disturbances.

Finally, such an entity as climatic fever must be reckoned with. I have frequently encountered this low type of fever in certain susceptible individuals, who suffer from nocturnal bouts of pyrexia, for which no other cause is apparent in humid heat, and whose symptoms disappear directly cooler conditions ensue.

It is often questionable whether too much importance may not be paid to the sensations of the patient, and the descriptions of what he himself feels. Sensations of "light-headedness", and of "cold water trickling down the back" are quite enigmatical. In this respect, the old tropical "hand" is a source of considerable difficulty. He usually knows more about fever than does his medical adviser. He can feel "malaria in his bones." Experience, however, proves that little or no reliance can be paid to these subjective sensations. It is unfortunately quite impossible to distinguish between the pyrexias of malaria, typhoid, *B.coli* infections, amœbiasis, influenza, kala-azar, cholecystitis, and even acute rheumatism, by mere sensation of fever.

### DIAGNOSTIC STEPS

The steps to arrive at a diagnosis should be taken in logical order, and may be stated as follows:—

#### *COMPLETE PHYSICAL EXAMINATION OF PATIENTS*

*Tongue* furred in most bacillary infections—remarkably clean in protozoal diseases, malaria, trypanosomiasis, and kala-azar.

Central white fur in undulant fevers. Dense fur in tonsillar, dental, nasal and sinus infections.

*Mouth.*—Pallor of mucosa in malaria and other blood diseases.

*Tonsils* must be examined for evidence of chronic streptococcal or other infection.

*Sinuses.*—Transillumination of the antra and frontal sinuses should never be omitted, followed up by an X-ray examination whenever necessary.

*Lymphatic glands.*—Enlarged in tuberculosis, sepsis, trypanosomiasis (cervical), blood diseases (Hodgkin's), syphilis, and bubonic plague.

*Generalized lymphatic enlargement.*—Syphilis, lymphogranuloma inguinale, glandular fever.

*Splenomegaly.**—1ST DEGREE: Sepsis, malaria (not in early infections). Infections with salmonella group, endocarditis, undulant fevers, relapsing fevers, trypanosomiasis, pernicious anæmia (occasionally).

2ND DEGREE: Malaria, kala-azar, miliary tuberculosis

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* Degrees of enlargement assessed according to Schüffner's scale.

(sometimes), splenic anæmia. *Bacillus coli* infections, septicæmia, acholuric jaundice.

3RD DEGREE: Septicæmia, splenomedullary leucocythæmia, leukanæmia.

*Enlarged liver.*—Malaria (chronic), kala-azar, hepatic amœbiasis, syphilis, carcinomatosis, suppurating hydatid, actinomycosis, pulmonary tuberculosis (occasionally), ascending pyelophlebitis and cholangitis, endocarditis, Weil's disease.

*Hepatic tenderness.*—Cholecystitis, amœbic hepatitis.

*Abdominal deep tenderness.*—Intestinal amœbiasis, acute colitis, appendicitis, diverticulitis—with abdominal symptoms—abdominal filariasis.

*Renal tumours or tenderness.*—Perinephric abscess, renal abscess, acute pyelitis, renal calculus, renal tuberculosis.

*Orchitis or epididymitis.*—Filariasis (*F. bancrofti*), gonorrhœal epididymitis, *B. coli* epididymitis.

*Pulmonary signs and symptoms.*—Acute bronchitis, influenzal bronchitis; pulmonary tuberculosis, hilum phthisis, pulmonary abscess, bronchiectasis, pulmonary amœbiasis and pulmonary signs secondary to liver abscess.

*Cardiac signs.*—Endocarditis, rheumatic fever—hæmic murmurs in blood diseases.

## *VALUE OF LABORATORY EXAMINATIONS*

*Examination of urine.*—Urobilinuria—important in malaria especially, and may indicate a recent rigor, even in the absence of parasites.

PUS CELLS.—Important—may indicate urinary tuberculosis; but more usually *B.coli* infections.

RED BLOOD CELLS often found in acute *B.coli* infections, may indicate a subacute nephritis. In small numbers suggestive of renal calculus and, in the absence of characteristic eggs, *Bilharzia hæmatobia.*

ORGANISMS.—The most frequent are *Bacillus coli* or its sub-varieties and streptococci—the cause of prostatitis, cystitis or pyelitis. Search for the tuberculosis bacillus should never be neglected.

*Examination of blood.*—Thick and thin blood films for malaria parasites when there is any probability of their presence. The subtertian parasite is often present in very scanty numbers in so-called cases of "low fever." It and the benign tertian parasite may be discovered when least expected, even in the absence of splenomegaly, in those who have been exposed to infection within a period of one to two years. In the absence of malaria parasites, other indications, such as basophilic stippling, must be taken into account.

*Leucocyte count,* one of the most valuable auxiliaries to diagnosis, should never be omitted. A leucocytosis may often serve as a guide to correct diagnosis, especially in suspected cases of hepatic abscess. In hepatic suppuration a moderate degree of leucocytosis is met with (from 15–30,000): in pulmonary conditions a high one, and also in acute *B.coli* infections of the urinary tract. Relative leucopenia may be characteristic of chronic malaria, sometimes of a salmonella infection. An absolute leucopenia (1–2,000) is diagnostic, and is almost invariably present in kala-azar. Considerable attention too must be paid to the differential leucocyte count. As a working rule a polymorphonuclear percentage over 80 indicates a bacillary infection—70 per cent. and under a protozoal one. A persistently high lymphocytosis, in the absence of direct bacteriological evidence, suggests tuberculosis. Perhaps, on the whole, too much attention is usually paid to the value of an eosinophilia. A high persistent eosinophilia may be produced by asthma and other pulmonary states and does not invariably accompany a helminthic infection.

*Serological reactions.*—Modern developments in serum-agglutination tests, have not made the path of the diagnostician any smoother. He has to battle with many factors unknown to a previous generation. The agglutination test is still of diagnostic value in salmonella infections. especially in the typhoid-paratyphoid group. It is of the utmost value in obscure brucella infections (undulant fever group), and the value of repeated agglutination tests in doubtful cases must be emphasized. The serum-globulin test (formol-gel reaction) is of considerable assistance in the diagnosis of kala-azar. The Wassermann and Kahn reactions should never be omitted.

*Van den Bergh reaction.*—This may be of great assistance, especially in gall-bladder infections, and in diagnosis of obscure hæmolytic states, as in Weil's disease, but it may lead to mistakes if it should be relied upon by itself without due consideration being paid to the clinical aspect of the case.

*Blood culture* is usually of little value except in the salmonella and brucella groups; in the latter it is necessary to make repeated cultures before a positive result is obtained. In suspected cases of Weil's disease, the inoculation of a guinea-pig with the patient's blood is necessary to establish the diagnosis.

*Fæces.*—A microscopic examination of the fæces must be undertaken as a routine. The discovery of the eggs of the *Ancylostoma duodenale* or of *Bilharzia mansoni*, may give the clue to the correct diagnosis, and the cysts of *E.histolytica* are naturally of great importance. Culture of the fæces may reveal *B. typhosus* and *B. paratyphosus* when a negative blood and urine result has already been recorded.

## *INFORMATION TO BE OBTAINED FROM STUDY OF THE TEMPERATURE CHART*

This is naturally of great importance in all branches of medicine, but is especially so when tropical fevers are concerned. The character of the rise of pyrexia is abrupt in malaria and relapsing fever, less so in other pyrexias, except tuberculosis, *B. coli* infections and intra-abdominal suppuration. A double crisis or double rise is frequently observed in kala-azar, and in subtertian malaria: periodic rises in benign tertian malaria, and in relapsing fevers. The temperature is hectic in tuberculosis, in liver abscess, and in sepsis. The temperature is undulating in the undulant fevers, irregular in lymphadenoma and in other blood states. In trypanosomiasis the fever is by no means characteristic.

*X-RAY EXAMINATION.*—This should never be omitted. Orthodiagrams of the heart may suggest endocarditis even when other signs are absent. Radioscopy of the lungs may well reveal hidden tuberculous infection or lymphadenomatous deposits, that of the abdomen, calcareous mesenteric glands.

*BARIUM ENEMA* may be helpful, especially in revealing diverticula which may be the source of the pyrexia.

### LIST OF POSSIBLE DIAGNOSES

*Blood diseases.*—Malaria, trypanosomiasis, kala-azar, relapsing fever, Weil's disease, undulant and abortus fevers, yellow fever, septicæmia, idiopathic blood diseases—pernicious anæmia and lymphadenoma—endocarditis, miliary tuberculosis, syphilitic fever, periarteritis nodosa.

*Urinary diseases.*—Perinephric abscess, *Bacillus coli* (or variants) infection—pyelitis, prostatitis and cystitis, epididymitis and cystitis—streptococcal infections, urinary tuberculosis, typhoid infection, bilharziasis (*B. hæmatobia*).

*Bowel diseases.*—Typhoid and paratyphoid, intestinal bilharziasis (*B. mansoni*), acute ulcerative colitis, amœbic dysentery (*E. histolytica cysts*), chronic appendicitis, diverticulitis.

*Abdominal diseases.*—Tabes mesenterica, lymphadenoma, diverticulitis, appendix abscess.

*Liver diseases.*—Hepatic abscess or hepatic amœbiasis, secondary carcinoma, hydatid cyst, ascending pyelophlebitis and cholangitis.

*Gall-bladder diseases.*—Cholecystitis and gall-stones.

*Lung diseases.*—Tuberculosis, bronchiectasis, pulmonary abscess.

*Lymphatic diseases.*—Lymphogranuloma inguinale, filariasis, glandular fever.

*Diseases of the nose and throat.*—Sinusitis, antrum infections, frontal sinus, septic tonsils.

*Diseases of mouth.*—Dental sepsis and apical abscesses.

*Joint diseases.*—Subacute rheumatism, incipient rheumatoid arthritis.

*Nervous diseases.*—Hysteria, acute poliomyelitis, syphilitic meningitis.

*Uterine diseases.*—Pyosalpinx, retained fœtus or placenta, uterine sepsis, pregnancy.

*Climatic diseases.*—Climatic fever.

Of all these fevers, the two which afford the scantiest information from the laboratory point of view, and which give the scantiest information to the clinician by the clinical signs which they may produce, are undoubtedly malignant endocarditis, and miliary tuberculosis.

## ILLUSTRATIVE CASES

Short histories of a selection of pyrexial cases are inserted in order to make clear the number of problems which present themselves in the ordinary routine of a consulting practice which is chiefly concerned with patients from the tropics or from abroad. Naturally the probability of some tropical or subtropical parasite being the cause of the pyrexia springs to mind; but, that this supposition is by no means always correct, the subjoined list amply justifies. In tropical practice all possible sources of fever must come under the purview of the diagnostician.

### I—*SUBTERTIAN MALARIA with periodic rigors and characteristic double rise in temperature*

This chart demonstrates the difficulties in diagnosis when the intricacies of tropical medicine are not fully understood. A young man of 25 was seen in April, 1933. He had landed in England from his first tour on the Gold Coast in February, 1933. Subsequent to that when in Barcelona, Spain, he was thought to be suffering from acute food-poisoning with diarrhœa, vomiting, urticaria and bad headaches. He had been admitted to a nursing home in March suffering from what was thought to be septicæmia, necessitating the injection of anti-streptococcal serum. At no time was any enlargement of the spleen noted and numerous blood examinations had proved negative for malaria parasites. Difficulty in diagnosis was further complicated by the fact that he showed ankle-clonus and bilateral positive Babinski sign. It was decided eventually that with such a characteristic chart the correct diagnosis must be subtertian malaria and on the twenty-fifth day of the fever subtertian ring forms were eventually found in fair numbers. On appropriate treatment with atebrin and small doses of quinine

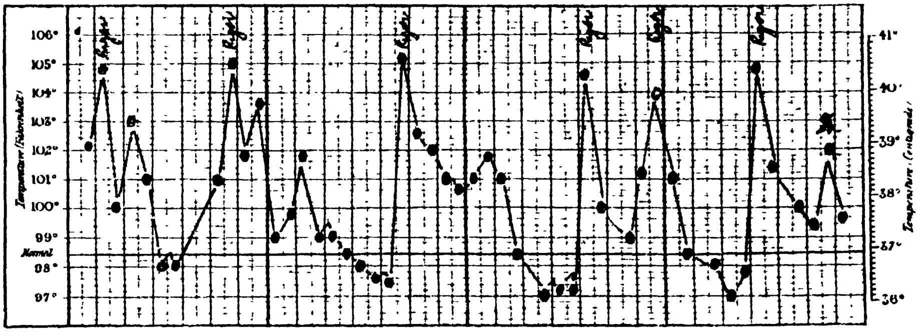

Chart 1. Case I.

(5 grains) the temperature rapidly terminated and in a few days the ankle-clonus and Babinski sign had disappeared. Both of these appear to be rare expressions of malarial toxæmia.

## II—*TRYPANOSOMIASIS* (*T. gambiense*) *fever beginning in England*

In July, 1930, a man, aged 40, was admitted with history of recurrent fever, said to be malarial. He had been in England one year subsequent to residence on the Gold Coast, was found to have enlarged cervical glands in posterior triangle of neck, slight enlargement of spleen and

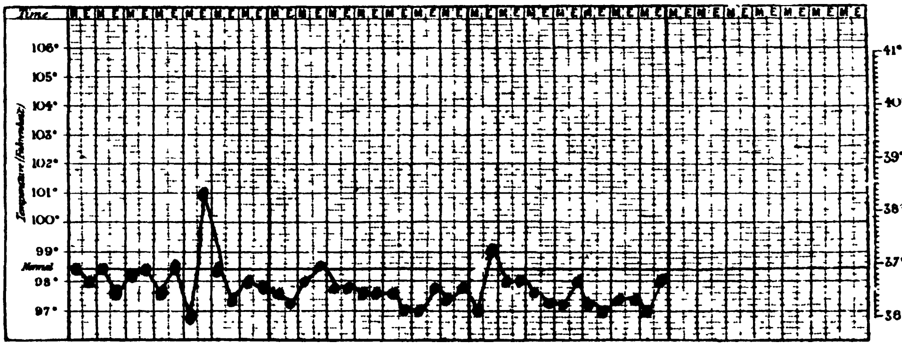

Chart 2. Case II.

inguinal glands. An erythematous inflammation around margins of old appendix scar was noted. Later irregular temperature with rather rapid pulse. Scanty trypanosomes were found in bloodstream, as also in gland puncture.

## III—*KALA-AZAR, beginning in England*

A young engineer of 20 attended hospital in May, 1932. He came to England from Calcutta in April, 1931, and had been taking a course of instruction in wireless telegraphy. He had left India as he was thought to be suffering from malaria and the fever attacks had gradually disappeared, but recently he had noticed that he was losing weight, his abdomen was becoming swollen and he was sweating at night. The liver and spleen were found to be enormously enlarged, the latter especially so, there was a marked coppery pigmentation of both legs and enlargement of the cervical and epitrochlear glands. Leishman-Donovan bodies were found in the liver puncture but, curiously enough, spleen puncture was negative. The leucocytes numbered 3,400; serum-globulin test was markedly positive. There was therefore no difficulty in arriving at a diagnosis of kala-azar. Treatment was spread over two-and-a-half months and he received altogether 10 gm. of neostibosan. His increase in weight was remarkable—in all 42 lb. Within a month of cessation of treatment he was seen in the Coldstream Guards marching in a squad from Buckingham Palace.

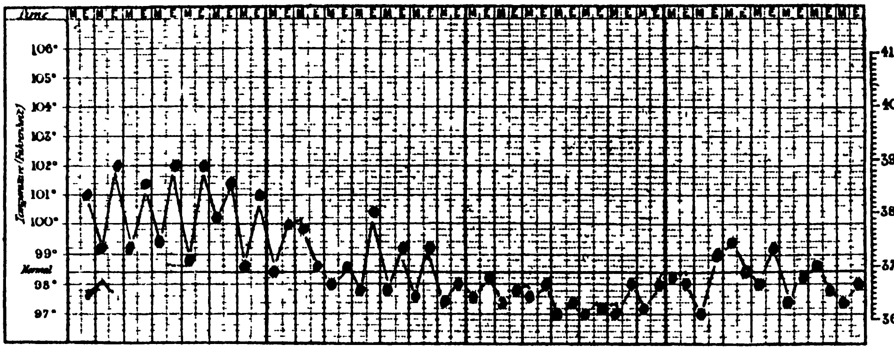

CHART 3. Case III.

## IV—RELAPSING FEVER (*Sp. duttoni infection from E. Africa*)

The chart is that of a patient admitted to hospital in 1930 who had recently returned from East Africa. At a glance at the peculiar characters of the chart the diagnosis of relapsing fever is almost obvious, yet repeated blood examinations had proved negative and the fever had not subsided despite intravenous injections of N.A.B. The patient later developed tenosynovitis of the right forearm and a rheumatic affection of the left shoulder joint—both complications of this well-known spirochætal infection. Ultimately the fever subsided.

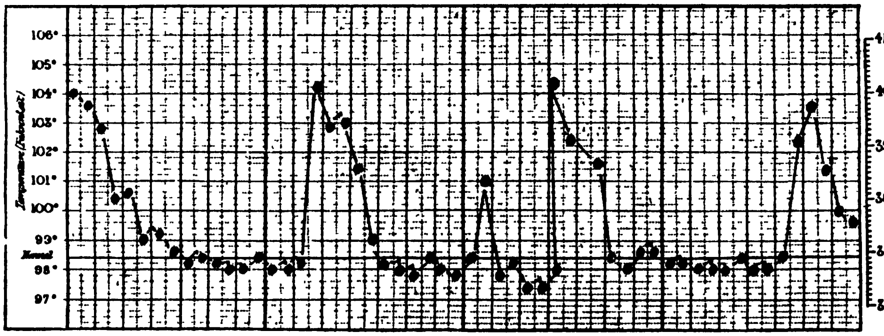

CHART 4. Case IV.

## V—*SYPHILITIC PYREXIA SIMULATING TYPHOID FEVER*

This is a most curious case in an official from the Gold Coast who was treated in June, 1934. He had served ten years in tropical Africa and fourteen days before admission to hospital he had suffered from fever with diaphoresis, joint and bone pains together with headaches so that naturally a typhoid infection was suspected. During exacerbations of the fever he had taken atebrin, suspecting malaria. The furred tongue, the general mental hebetude and photophobia suggested a salmonella infection and this received some support from the fact that the serum agglutinated *B. typhosus* 1 : 125. (He had not been inoculated for many years.) During the third week of the fever a small vein in the left leg became thrombosed and this was followed soon afterwards by double conjunctivitis, iritis and a profuse pityriasis rosea type of rash. At this time the Wassermann and Kahn reactions were strongly positive and when a small intra-urethral chancre had been revealed, the real diagnosis of acute secondary syphilis became obvious. The pyrexia yielded immediately to anti-specific treatment with injections of neo-salvarsan.

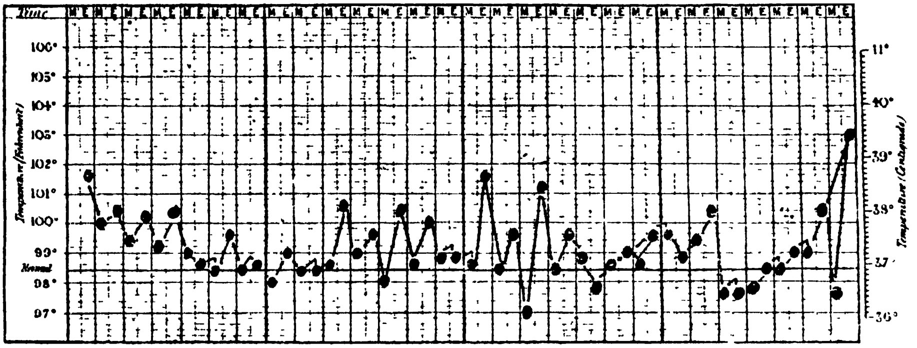

CHART 5. Case V.

## VI—*UNDULANT FEVER* (*Abortus type*), *Br. abortus isolated from blood culture*

An engineer of American extraction was seen in March, 1933, said to be suffering from recurrent attacks of malaria as he had previously resided in

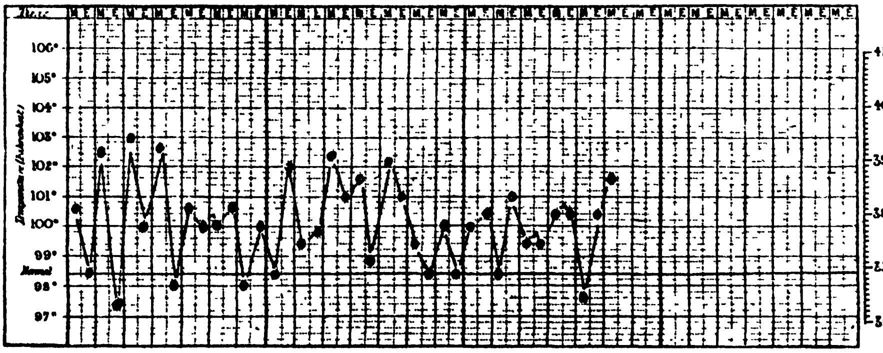

CHART 6. Case VI.

Honduras and Mexico. He had frequent rigors and the temperature varied between 102–103° F. His tongue was slightly furred and the tip of the spleen was just palpable. He complained of loss of appetite, dull headaches and frequent perspirations. Quinine had no effect upon the temperature. The serum-agglutination test was conclusive. *Br. abortus* was agglutinated 1: 10,000 and *Br. melitensis* 1: 5,000 and there was complete absorption of the agglutinins by cultures of the former organism. Still more conclusive proof was obtained by the isolation of *Br. abortus* from the blood-stream which became apparent after twenty-three days incubation. The intradermal melitene reaction was strongly positive. The fever was terminated by protein-shock therapy and the patient left hospital within four days of cessation of treatment with a normal temperature.

## VII—*CLIMATIC BUBO* (*Lymphogranuloma inguinale*)

In 1924 I was called into consultation to see a young man of 32 recently arrived from British Guiana. There was a history of recurrent attacks of fever with rigors, night sweats, furred tongue, pains and aches in bones. Various diagnoses including typhoid and plague had been suggested. There was a leucocytosis of 14,000. The inguinal glands were slightly enlarged and painful. Four days later climatic bubo with extensive intraglandular and periglandular suppuration became obvious. The patient was successfully treated by intravenous "protein shock." The diagnosis was slightly confused in this case as the serum agglutinated *B. typhosus* 1 : 140 and *B. paratyphosus B.* 1 : 80 as the result of recent inoculation.

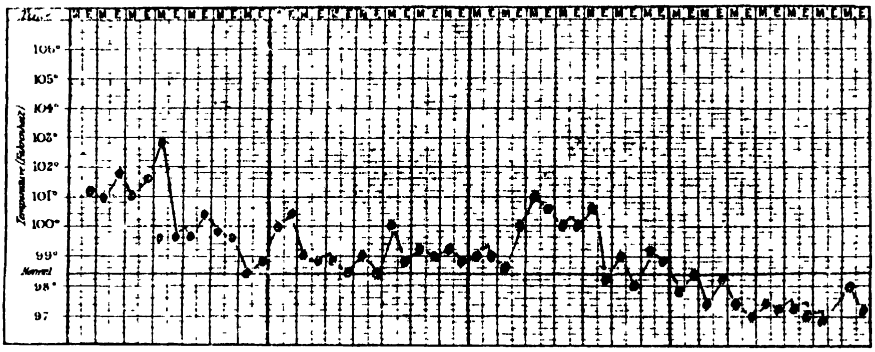

CHART 7. Case VII.

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## VIII—*FILARIAL FEVER simulating appendicitis*

An Australian soldier was seen in September, 1917, on admission to hospital as a case of acute appendicitis. He had suddenly been seized with acute pain and tenderness in the right iliac fossa, together with arthritis and periarthritis of the right ankle joint. There was enlargement of the inguinal glands which were also slightly tender. Later pain radiated down the cord to the right epididymis. There was a temperature of 103·5° F. and a leucocytosis of 32,000, but no eosinophilia. Microfilariæ (*F. bancrofti*) were found in the blood at night time. The fever gradually defervesced and later a right sided hydrocele became apparent and was tapped.

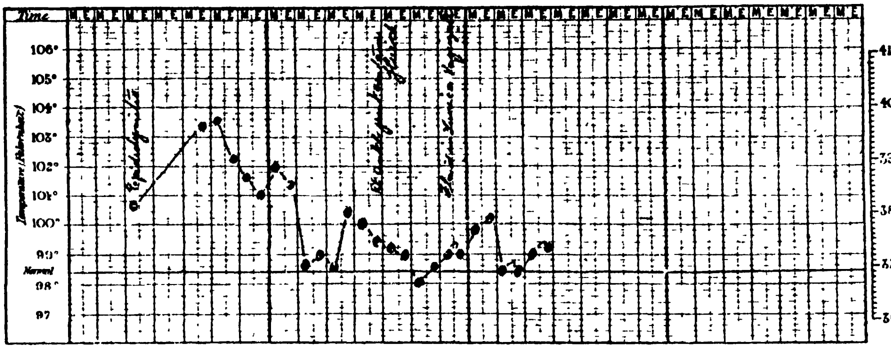

Chart 8. Case VIII.

## IX—*A TYPICAL CASE OF AMŒBIC ABSCESS OF THE LIVER RESPONDING TO EMETINE INJECTIONS AND ASPIRATION.*

A tea-planter from Assam was admitted to hospital in April, 1930. He had suffered a good deal during his residence in the country from repeated attacks of malaria and in February, 1929, he had had amœbic dysentery for which he had been treated with emetine. In June, 1929, he began to suffer from repeated rigors which did not respond to quinine therapy. There were night sweats; he grew weaker and his complexion assumed a subicteric tint.

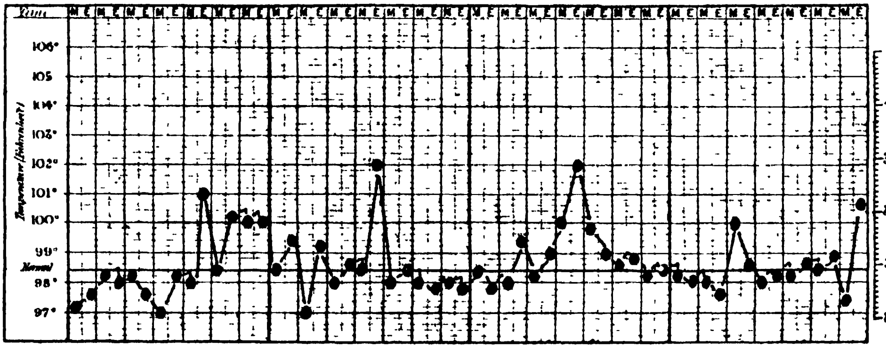

Chart 9. Case IX.

He was found to have an enlarged and tender liver with signs at the base of the right lung, a leucocytosis of 18,000 and secondary anæmia. No cysts of *Entamœba histolytica* were found in the fæces. The chart shows how remarkable was the response to emetine injections combined with aspiration of pus from the liver. The patient was just one month in hospital altogether and has remained well ever since.

## X—*AMŒBIC HEPATITIS WITH RECURRENT RIGORS*

In November, 1927, an ex-officer was admitted to hospital suffering from recurrent rigors of inexplicable origin. He had served in Mesopotamia during the war and had suffered from amœbic dysentery for which he had received intensive treatment. He had been ill for over five months and many diagnoses had been advanced none of which received adequate confirmation. The leucocytosis had varied between 11–30,000. On the supposition that this might be an expression of malaria he had received both intravenous and intramuscular quinine medication. His teeth had all been extracted and at this time a streptococcus had been isolated from his blood and he had received anti-streptococcal serum therapy. Twelve consecutive fæces examinations had proved negative, but on the thirteenth numerous cysts of *Entamœba histolytica* were found. The fever eventually yielded to intensive anti-amœbic therapy (E.B.I. 45 grains), reinforced with yatren. Convalescence was retarded by the appearance of large intramuscular abscesses in both buttocks which had to be opened and which were proved to be due to the quinine injected two-and-a-half months previously.

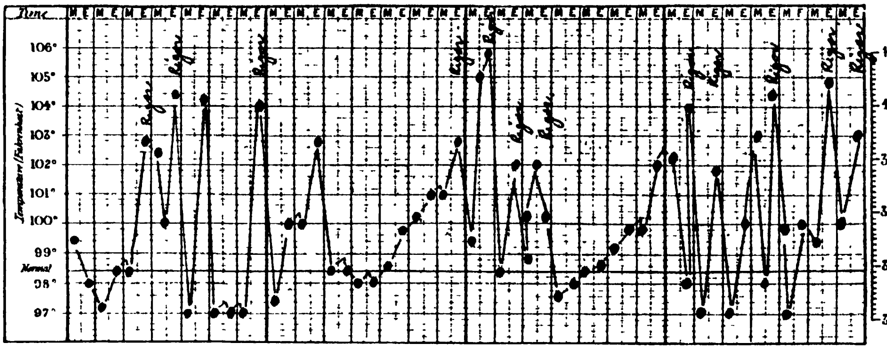

Chart 10. Case X.

## XI—*PERIARTERITIS NODOSA, with irregular pyrexia and high eosinophilia.*

This temperature chart gives an inadequate idea of this most puzzling pyrexia which defied every means of diagnosis and which remained insoluble until a biopsy of the gastrocnemius muscle undertaken in the Presbyterian Hospital in New York revealed the true diagnosis. The patient was a man of 34 years of age who was born in India and who had lived there till thirteen years of age. Later he had returned from the United States and worked for another thirteen years in the N.W. Provinces of India. He was admitted to hospital in June, 1936, and gave a prolonged history of malaria, one attack of amœbic dysentery and had also suffered from bronchial asthma for eight years together with hay-fever and urticaria. The outstanding symptoms were neuritic pains and tingling in the soles of the feet and finger tips, together with weakness of the extensors of the leg and ulnar muscles of the left arm. The main features found on blood examination were secondary anæmia of the microcytic type with a high eosinophilia varying from 49–72 per cent. and a leucocytosis of 14–24,000. The urine invariably contained albumin and occasionally red blood corpuscles and leucocytes. All possible investigations including gastric analysis, blood culture, lumbar puncture, complete X-ray and biochemical examinations were undertaken without any positive information being obtained. From time to time a vague systolic murmur was noted at the base of the heart and a suspicion was aroused that the pyrexia might be due to infective endocarditis, but no confirmatory evidence was obtained. He was transferred to America on August 12, and died in New York on September 30, 1936. The true diagnosis was made shortly before death and was completely vindicated at autopsy. (It is noted that at autopsy a patent foramen ovale was revealed.)

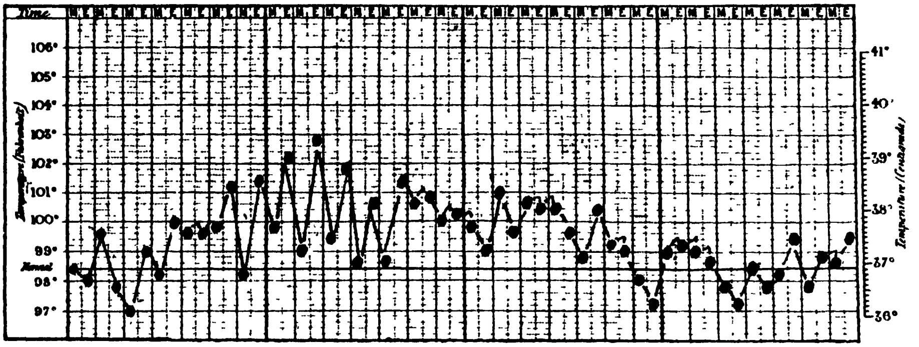

Chart 11. Case XI.

## XII—*LYMPHADENOMA* (*Pel-Ebstein disease*)

In 1922 an ex-soldier who had served in Egypt and Mesopotamia during the War was sent into hospital as a pyrexia of unknown origin which resembled in its type some form of relapsing fever with splenomegaly. The span between each pyrexial bout was one of nineteen days. In spite of the most laborious research there was no positive or even suggestive, data. Radiographic examination was entirely inconclusive. At autopsy slightly enlarged mediastinal glands were found showing the characteristic structure and also lymphadenomatous deposits in the spleen.

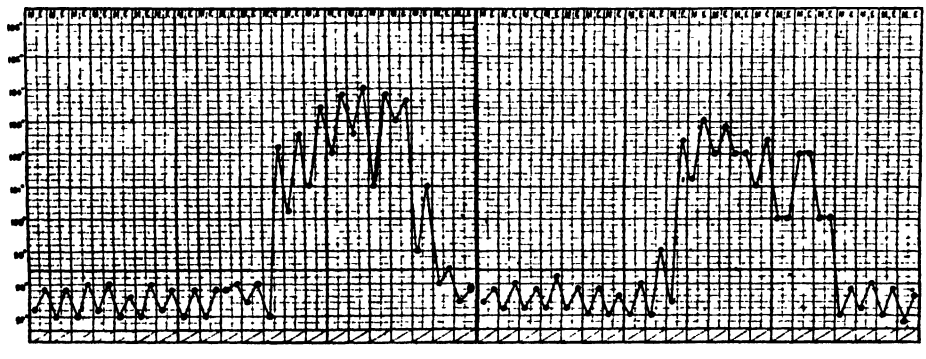

Chart 12. Case XII.

## XIII—*HYSTERICAL PYREXIA WITH SIGNS SIMULATING TUBERCULOUS MENINGITIS*

This interesting case of hysterical mimicry associated with hectic fever occurred in a nurse of 32 years of age who was admitted to hospital in February, 1923. She had served continuously in Egypt and Mesopotamia during the War and complained that since this experience she had never regained her health. Since October, 1922, she had experienced severe feverish attacks with headaches, pains in the back and limbs, vomiting and diarrhœa. She was of a distinctly impressionable make-up and showed a marked fine tremor of her hands. Repeated physical examinations failed to discover anything definite and it was noted that the pyrexia and diarrhœic attacks appeared to coincide and that, when the temperature was high, she showed definite signs of mental confusion. After reading that her brother had contracted meningitis, she soon developed signs of this disease with head retraction, intense headaches, photophobia and other symptoms suggestive of tuberculous meningitis. Lumbar puncture yielded a normal cerebrospinal fluid. In spite of everything her general condition remained good. On ceasing to take periodic readings with the clinical thermometer her temperature became normal and the condition was definitely proved to be hysterical.

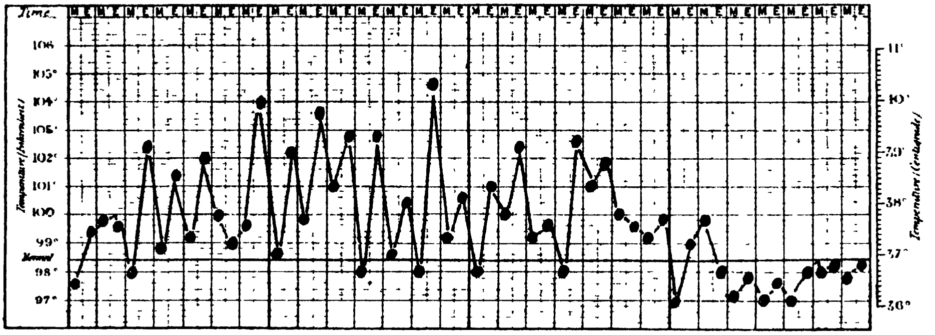

Chart 13. Case XIII.

I wish to express my indebtedness to my colleague, Dr. W. E. Cooke, for his great assistance in collecting material for this article.

# THE MEDICAL ORGANIZATION OF AIR RAID PRECAUTIONS

By WILLIAM C. BENTALL, O.B.E., F.R.C.S.

*Assistant Surgeon-in-Chief, St. John Ambulance Brigade.*

THIS subject can advantageously be dealt with under three headings; (1) The general scheme of the Government for air raid precautions; (2) The medical personnel required; (3) The necessary buildings.

### THE GENERAL SCHEME

In July 1935 the Home Office acting on behalf of the Government issued a carefully drawn-up scheme for this work, and sent copies of it to the clerks of all councils throughout the country. They were asked to pass on certain sections of this advisory note to the departments of their council especially concerned, namely the Health Department, the Police Department and the Fire Department. The instructions which come under the Health Department, for which the Medical Officers of Health were asked to be responsible, cover essentially all the medical points of the scheme and the important parts of this advice were issued in Air Raid Precautions Memorandum No. 1, the pamphlet of sixteen pages giving detailed suggestions for dealing with the subject from the medical point of view. This memorandum has already passed through a second edition and many further detailed advices have been issued from the Home Office. A series of Air Raid Precautions Handbooks have been published. No. 1 and No. 2 are especially for the training of first-aid workers, and No. 3 is now being published especially for medical men and nurses and covers the subject exceedingly well from the point of view of pathology, symptomatology and treatment.

As a gas attack would usually be prefaced by high explosives and incendiary bombs, surgical casualties have to be catered for as well as those resulting from poisonous gases. To deal with this possibility detailed and elaborate arrangements have been made for the establishment of first-aid posts, about which more will be said under buildings in paragraph 3. The training of personnel for these first-aid posts bulks largely in this part of the scheme and the Home Office applied to the authorities of the St. John Ambulance Brigade and the British Red Cross Society to supply the voluntary staff for these places, and in addition asked these voluntary organizations to train instructors who can be used by the municipalities for lecturing to members of the general public as the scheme evolved.

Behind the first-aid posts, casualty clearing stations and base hospitals were envisaged, all to be linked up by an efficient ambulance service. Arrangements were also to be made for the decontamination of affected material, such as clothing, ambulances, buildings and streets. The decontamination of people and their clothing comes under the medical supervision, whereas the decontamination of buildings and streets, comes under the highway authorities. In several counties already the county Medical Officer of Health has drawn up elaborate maps of the area for which he is responsible, even marked with the selected first-aid posts, casualty clearing stations and base hospitals, and the training of personnel has been vigorously carried out in some areas though less so in others. The workers of the St. John Ambulance Brigade and the British Red Cross Society immediately had special classes started for the training of their own membership, 80,000 of whom are in the St. John Ambulance Brigade.

### MEDICAL PERSONNEL

Very large numbers of trained personnel are required—

(*a*) To form first-aid parties for collecting casualties.

(*b*) To render first-aid for gassed and wounded cases at the first-aid posts.

(*c*) To supervise transport to casualty clearing stations and base hospitals.

(*d*) To staff casualty clearing stations and base hospitals.

(*e*) To train first-aiders.

(*f*) To train instructors for the teaching of the public.

The last three groups are those in which qualified medical men may render great help. For the first three groups the Home Office has asked the St. John Ambulance Brigade and the British Red Cross Society to train its large personnel, and from amongst their officers to train instructors in air raid precautions work, who are to train the general public. Already some 40,000 St. John Ambulance Brigade men and women have taken special courses in the subject, and many have passed necessary examinations and hold certificates ; as have a large number of British Red Cross Society's workers. Further these voluntary organizations have trained large numbers of instructors who have passed examinations—written, oral and the delivery of a lecture—and obtained the "Grade I Instructor's Certificate" which the Home Office officially recognizes for teaching the general public at classes organized by municipal authorities. The Home Office have also established the Civil Anti-Gas School at Falfield in Gloucestershire, where groups of selected men are instructed for a period of ten days including much practical work. Chief Constables, public service men attached to the Councils, Fire Brigade Officers, St. John Ambulance and British Red Cross Officers, are all received for instruction in their special duties. The certificates obtained are known as the "Civil Anti-Gas School Certificate" and rank as the highest obtainable. The Home Office are planning to open a second such school in Yorkshire at an early date.

A course of instruction has recently been inaugurated for general practitioners. Several medical men have been trained and appointed under the Home Office to lecture to general practitioners throughout the country under the auspices of the British Medical Association. These lectures, six in number and of two hours each, are intended to give practitioners all information on the subject so that they may deal with queries from their patients and also to prepare them to fit into the whole scheme on their hospital staffs. But these courses are perfectly voluntary, no registration of attendance is kept, no examination is conducted, and no certificate granted.

They are therefore not recognized as qualifying courses for instructors or examiners, and this point should be borne in mind by the profession. The St. John Ambulance Brigade have for two years been conducting special classes for instructors. The medical practitioners associated with this organization have nearly all of them taken these courses. Others outside the organization may take these instructors' lectures and after sitting for the examination may obtain the "Grade I Certificate."

The next big forward step is the widespread education of the general public, requiring an increasingly large staff of trained instructors. It must always be remembered that this widespread education of the people is one of the biggest safeguards against gas attacks by an enemy, because adequate and practical precautions can render a gas attack harmless. The secret intelligence departments of all nations to-day who might use war gas is so effective that exactly what amount of air raid precautions can be taken by any nation is certainly known to others, and no enemy is going to risk men and material on a gas attack which is known will be in vain owing to adequate precautions being intelligently carried out. This is a point the public at large and all public authorities should fully realize.

To achieve this great result councils of counties, boroughs, urban and rural areas should organize large public meetings to be addressed by a popular speaker on the subject, and at such a gathering when the audience has caught the idea of the scheme and is keen to know more, recruits for a course of full instruction may be at once enrolled, instructors secured, and a course of ten or twelve weekly lectures forthwith commenced. It is essential that instructors should have a "flare" for "getting the subject across." A prosaic and inexperienced teacher full of highbrow knowledge will damp the ardour of any crowd, and classes taught by such instructors will fade away, whereas experience has shown that the reverse holds good and classes increase under good teachers because the subject is capable of being made so interesting on popular lines. Members of such classes when completed may sit for examination and obtain certificates, and the great service of the St. John Ambulance Brigade and the British Red Cross Society is that at the request of the Government they have prepared their qualified instructors and the necessary plant for such teaching all over the country, which is awaiting to serve the councils in this way, and the councils have been advised that this machinery awaits their setting in motion. The hesitancy of councils to risk expense has put a brake on this public instruction, but many areas have pushed ahead and especially in some of the large western and midland cities enormous numbers of people have already been instructed and obtained their certificate, sample refuge rooms against gas are equipped and practice in the use of the various types of respirators, methods of decontamination of people and places after a gas attack are experimentally carried out; the wearing of protective clothing against mustard gas is practised and understood; first-aid posts are established in these prepared areas ; and staffed and equipped. ambulance services arranged, and casualty clearing stations and base hospitals organized. Such an area in any gas attack (apart from high explosives or incendiary bombs) would be invulnerable, and the confidence engendered in the public so trained would prevent the prime object of a gas attack on the civilian population, which is to produce panic. In this valuable national service the medical profession has a great part to play, firstly by being ready to pass all these facts on to that great army of people who are their patients, and who naturally and rightly turn to them for knowledge and information on all matters of such vital importance as the preservation of health and immunity from any harm, secondly by being prepared by adequate knowledge to assist in the teaching of the public, or fitting into the scheme of medical and surgical service, or exerting personal influence on local councils and their members to get a "move on" in this matter.

### BUILDINGS

In this scheme the Home Office advise councils to select three types of buildings:—

(*a*) First-aid posts.
(*b*) Casualty clearing stations.

(*c*) Base hospitals.

(*a*) *First-aid posts.*—The prime object of these buildings is to treat in a first-aid way all gas casualties both for gas infection and minor wounds. Also the people are to be trained to go to first-aid posts and not to hospitals because these buildings are specially prepared and staffed for this work and also because hospitals must be kept for more serious cases and will not be equipped to the same extent for decontaminating infected cases. These posts should be selected in any area in proportion to the population, approximately one first-aid post to three thousand or four thousand people. They must be buildings easily approached and of such a plan as to allow for a series of separate rooms for treatment. A veranda is useful or one improvised by a lean-to with corrugated roof where stretcher bearers may unload their cases and themselves (clothed in full protective clothing) wade through trays of bleach solution to remove liquid mustard gas on their gum boots. The cases must be divided into males and females because a bathing process lies ahead, and further the male and female sections should lead to two sets of rooms, one for those infected by persistent gases and those by non-persistent gases. The persistent gases being chiefly mustard gas would if mixed with the others infect them and increase their danger. Thus four suites of rooms are needed.

In the suites for contaminated cases there should be a reception room where details of cases can be entered up by receptionist clerk, and valuables received, packed and labelled, clothes entirely removed and passed through a shoot into a bin from which the municipal authorities are trained to remove them for decontamination. Thence the casualties pass into a bath-room fitted with a floor that will run off the water and a series of hot showers under which the patients are placed (four patients to one first-aider), smeared over with a bleach paste to neutralize the mustard gas, which if done promptly will prevent all blistering and subsequent trouble, after 3 to 5 minutes the shower is turned on and patient sluiced down. The mustard gas will be neutralized by the bleach so that the effluent is harmless. Each patient dried with a fresh towel is then passed into the dressing and waiting room, where stores of clothes provided by the Government await them. Incidentally it should be remembered that the types of clothing for this purpose has taken many committee meetings at the Home Office to evolve. Dressed, disinfected and with wounds attended to they await a signal from the authorities that not only has the raid passed but that the neighbourhood has been decontaminated of persistent gas. Only then may the patients be sent home or to the casualty clearing station for further treatment if necessary.

The requirements of such a building are exacting and difficult to find. Amongst those most suitable are elementary schools, first because they are divisible into the required sections, and also because the larger modern ones have adequate water supply with slight adaptations by local plumbers. Other buildings may be swimming baths in large cities, or golf club houses are being adapted in some centres. Clubs or church buildings, may all be adapted, or perhaps one set of rooms at one building and others at another building nearby. Admittedly it is difficult to visualize the possible conversions of quaint old buildings to the needs of a first-aid post, but it is one of the prime parts of the scheme, and in many parts of the country much praise is due to the skill by which they have been supplied by energetic and resourceful officers.

(*b*) *Casualty clearing stations.*—The needs of these intermediate treatment centres may be met by the cottage hospitals, convalescent homes, large nursing homes or smaller town hospitals. There should be one casualty clearing station to serve four or five first-aid posts. More serious surgical casualties should be sent on to them after being decontaminated at the first-aid posts. Cases of phosgene poisoning having been warned at the first-aid post of the absolute need of rest are lifted into an ambulance and sent on for oxygen treatment and nursing, bearing in mind the pulmonary œdema and possible sudden heart failure. Blisters if formed may be evacuated with aseptic care, fractures or other surgical casualties or gross infection of the eyes by liquid mustard gas which lead to panophthalmitis if not adequately treated, and other conditions of similar severity must be attended to. Cases needing more specialized treatment must be sent on to the base hospitals. Casualty clearing stations should have a small outside building which may be adapted for decontamination in the event of cases needing such treatment unexpectedly turning up. The local practitioners should be available to serve in these places backed up by a staff of trained nurses and necessary equipment.

(*c*) *Base hospitals.*—The need for these is met by the large county or central hospitals fully equipped with a specialized medical and surgical staff, and for full radiological and pathological examinations. One of these should serve five or six casualty clearing stations in any county area, and to them should be sent those cases too severe to be adequately dealt with at the smaller hospitals. At these base hospitals again some outside building should be converted into a small decontamination post lest any casualties too severely injured to be handled at the first-aid post should be sent on straightaway. In some parts of the country these schemes are well advanced, in others they are painfully backward; but whatever the action of the local authorities may be, certain it is that never has a government department by extensive chemical research, toilsome practical work, admirable British teamwork in all departments, handled a problem of such magnitude with such efficiency as the Air Raid Precautions Department of the Home Office.

# AIR WARFARE AND THE GENERAL PRACTITIONER

By L. HADEN GUEST, M.R.C.S., L.R.C.P.

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IF air war should come to this country, the general practitioner and every practising or active member of every section of the medical profession will need to have certain special and technical information to help him in his treatment of cases and in his recommendations for the prevention of casualties.

The practitioner must have:—

(1) A knowledge of the outline of the methods of air warfare and of the characteristics of modern military aircraft and bombs.

(2) A knowledge of the effects of incendiary substances and poison gases as well as of high explosives on the human body.

(3) A knowledge of the emergency means of protection for individuals given by the different types of respirators, viz. the "General Civilian," as used by the general population, the "Civilian Duty," as used by certain medical and ambulance services and by key-men and women at special points of importance in public services and the "Service Respirator," as used by soldiers, the police, special services, A.R.P. doctors and others.

(4) A knowledge of the methods of preventive anti-gas treatment for the avoidance of damage by blister gas.

(5) A knowledge of the methods of decontamination of the clothing of individuals (*a*) as a preventive measure, (*b*) as a method of cleansing from blister gas.

(6) A knowledge of the methods of decontamination of roadways, houses inside and out, contents of houses, motor cars, public service vehicles and in general all material objects.

(7) A knowledge of the means of constructing gas-proof refuges in private houses, offices, workshops or factories

or public buildings.

### GENERAL CONSIDERATIONS

The practitioner will need this information partly for his own use and application in his practice for purposes of treatment should need arise, and partly in order to be able to hand the knowledge on to his patients who will certainly apply to him for information.

It must be emphasized that the question of the propriety and necessity of acquiring this knowledge of air warfare and especially of gas warfare is quite distinct from the question of the nation's policy of peace or war. No one reading the daily newspaper to-day could fail to realize that war is not only a great danger but a definite and terrible practical possibility. How to avoid that war, how to guide the nation's policy into the ways of peace should be a matter of day and night consideration not only for statesmen but of all responsible men and women. But apart from this duty which is incumbent on the individual medical practitioner and on the medical profession as a whole as on every profession, the general practitioner has the special duty of knowing how to treat air raid casualties if they arise and how to use special knowledge to prevent casualties under air raid conditions in so far as it is possible to do so.

It has been urged as a criticism of lectures given by official medical instructors of the Home Office that these lecturers have suggested that it would be a part of the duty of doctors at a time of air attack to help to keep their patients and the general public calm and disciplined. It is always the duty of the doctor to help towards a calm and disciplined way of behaviour and of life. More than half of all medical practice consists in the allaying of unnecessary fears based on ignorance, in the removal of anxiety by sweet reasonableness and truth, and in the case of real danger of death or severe injury by the giving of such wise counsel as will enable the individual patient to face what confronts him with courage and fortitude. It is an extension of this not ignoble part of the practitioner's daily duty to the larger sphere of the public calamity of an air raid which will be of great help at a time of emergency.

If an air raid comes to any part of our country it will be a terrible experience. But it will be a terror magnified out of all proportion to the real danger if the general public do not know the facts and have only scare stories and invented horrors to go on. Residents in any area must know what is the danger from high explosive and from incendiary bombs in their neighbourhood and what is the danger from gas there. They must know what the gases are and what means of protection exist. They must know how to make gas-proof shelters for themselves and how to wear the respirator. They must be taught how to use anti-gas preventive treatment on themselves in case of mustard gas contamination.

In the absence of such knowledge an air raid would lead to panic and to serious panic casualties quite apart from anything an enemy might do. And in this panic an attacked population would be in the situation most exposed to attack and least defended against it. It may be said that the education of the general public cannot be entirely saddled on to the backs of the medical profession and that is true. The Government will issue information to the general public from time to time and the number of lectures given by the Order of St. John, the British Red Cross Society, and the Order of St. Andrew will increase and carry knowledge to an ever-widening audience. A further source of knowledge will be in the nursing profession all of whose members are eventually to receive instruction of the same kind as that given by Home Office medical instructors to medical practitioners. In one way or another, therefore, the amount of knowledge of air attack and of air raid precautions will go on increasing steadily. And the question of treatment of casualties and of methods of avoidance of danger and of prevention of casualties which are very largely medical questions will more and more come to the fore in public discussions, and more and more practitioners will be asked questions about them.

Many questions will be asked to which the medical practitioner will not be able to give a complete reply but it is possible to indicate if not the outline of a complete reply at least the outline of a direction of inquiry. Many people are concerned about the danger of high explosive bombing from the air. The reports from Spain and the story of Guernica in particular have impressed themselves vividly on the popular mind. But an air attack on Guernica, an open undefended town with no defending air force, with no anti-aircraft guns and without air raid precautions of any kind apparently, bears no comparison with a possible air attack on any part of the British Isles. In Great Britain there is an efficient Air Force, efficient anti-aircraft guns and other means of defence and an efficient air raid precautions organization is being built up. Nor is there any direct comparison possible between an attack on a small township as a demonstration of "frightfulness" and an attack on this country which would have to be aimed at vitally important military objectives. The mere area of London and the industrial area of Birmingham, Lancashire, Yorkshire and other parts of the country make attack difficult. No foreign power has enough aeroplanes to attack more than one comparatively small part of these great areas at a time.

### HIGH EXPLOSIVE AND INCENDIARY BOMBS

In reply to a question about high explosives it may, therefore, be said truthfully that the larger part of the country will never be attacked at all and that in areas attacked it will be primarily points of military importance (e.g. docks) which will suffer and houses and flats only incidentally because of their proximity to these points. Incendiary attack by small 2-lb. thermite bombs will be more widespread and may possibly include residential areas but the increased and strengthened fire-fighting services being set up with the aid of the Home Office will attend to that.

What then of the risks of high explosive bombing and of incendiary bombs? The risk of high explosive bombs depends on the site of residence. If this is in a country town or village it is remote, if next door to the docks or a big power-station it is considerable. But protection by fortification would mean several feet thickness of reinforced concrete. This is frankly impossible in almost all cases. The householder in a potentially dangerous area should be ready to leave his home at short notice in case of war.

Protection against incendiary bombs can be given by five inches of reinforced concrete—many business premises have this already—and emergency arrangements for the quick extinguishing of a fire must be made. The control of the thermite incendiary bomb must be by removing it in a bucket of sand into the open air where it can burn itself harmlessly out. The heat generated is 3,000° C. and the light is blinding and needs the use of dark glasses as used in electric welding.

In the treatment of injuries by high explosive bombs or burns there is nothing unfamiliar to the doctor, but a direct thermite burn, it should be noted, is a burn by liquid iron. But what the doctor may be asked about, at a time of international emergency, is as to the degree of exposure to danger of a particular house or street. This is a matter of the position of the house or street in relation to points likely to be attacked and the answer must be based on local knowledge. In any large town, however, it will be desirable to advise the removal of children, old people, invalids and in fact of all who can be spared into a country area where they will be safe from attack. It is probable that Local Authorities may make large scale arrangements to facilitate such removal from the poorer and more congested parts of the cities.

## GAS WARFARE

It is on the question of poison gas that the practitioner will probably get most of the questions asked by patients and on which his knowledge will be most useful. Of high explosive and incendiary bombs, the airman and soldier can speak. Of gas, as far as the general public is concerned, it must be the medical practitioner. What the practitioner needs to know about gas is all that there is in the Air Raid Precautions Handbooks 1, 2 and 3, published by the Stationery Office, and as much more as possible. "The Medical History of the War" is still the most useful of all publications dealing with gas warfare. And every medical man and woman should, if possible, attend one of the courses of lectures now being arranged by the British Medical Association in all parts of the country at which the up-to-date information on the subject is given. The technique of medical methods to counter gas injuries and to prevent them is not a stationary subject. It a rapidly improving one.

The first question to be asked about gas warfare is: What are the gases which will be used? And the answer is that despite intensive research in all countries the types of gases which will be used in any future war are the same as those used in the world war of 1914–1918. The gases belong to five main types:

(1) The tear gases.
(2) The nose-irritant gases or toxic smokes.
(3) The lung irritants.
(4) The blister gases.
(5) The paralysant gases.

Group 5, the paralysant gases, of which the most important is hydrocyanic acid, are of little practical importance because they diffuse so rapidly in the air as to have only slight casualty-producing power. They were tried out between 1914 and 1918 but are not likely to be used again. Of the four remaining groups the first two, the tear gases and the nose irritants, are harassing gases but not casualty-producing gases. Tear gas and nose-irritant gas cause so much temporary distress, the one by lachrymation and the other by severe nasal and upper respiratory irritation and pain as to make any kind of work impossible in their area of action except for persons wearing anti-gas respirators. But they cause neither permanent injury or death.

The next two groups, the lung irritants and the blister gases, are both dangerous. They cause serious injuries to those exposed to them without adequate protection and in a certain proportion of cases they cause death. Persons adequately protected against these gases will not suffer injury and as the proportion of deaths to the total number of gas casualties in the 1914–1918 war among those affected was only between 2 and 4 per cent., they are very much less deadly than casualties caused by bullet, shrapnel, bomb, and shell. Under civilian conditions, that it, if air raid precautions are properly organized, the total number of those exposed would be small and the total casualty list proportionately less than in the war.

The chief gases of the lung-irritant groups are phosgene and di-phosgene with chlorine and chloro-picrin as of secondary importance. Di-phosgene may be regarded as a variant of phosgene and acts in the same way. Phosgene is the member of this group likely to be used in large aerial bombs. In unprotected people it causes first upper respiratory lung irritation and secondly œdema of the lungs. It is this second effect which is so dangerous. It may come on insidiously and the victim be unaware of it until extra exertion calling for extra oxygen from the lungs, which cannot be given because the lung is flooded, leads to the acute onset of asphyxia. The rule of evacuation of phosgene poisoning cases from the front line in the war was that every case must be treated as a stretcher case. The same rule will apply in the case of civilians with the added proviso that every case, or suspected case, must be sent direct to a hospital and not to a first-aid post.

### MUSTARD GAS

All the gases dealt with so far have been those affecting eyes. nose or lungs. Any one of the three types of respirators, i.e. "General Civilian," "Civilian Duty" and "Service" will give complete protection against them because the rubber face-piece covers the whole face including eyes and nose and the air-filter cleans out the gases from the air before it is breathed in. The tear gases and the lung irritants are absorbed by the granulated charcoal which the respirator filters contain; the nose irritants are filtered out by layers of special wool. The nose-irritant gases, it should be mentioned, are in reality particulate clouds which the layers of special wool filter out. But the next group of gases, the blister gases, not only affect eyes, nose and lungs, but also any part of the skin, or of the digestive tract which vapour or liquid can reach.

The respirators, all of them, give complete protection to eyes, nose and mouth and lungs, but the respirator on the face does not, of course, protect the skin of any other part of the body. The effect is one produced by direct contact. It has nothing to do with any absorption from any other part of the body.

The important member of this group is mustard gas, and it was used very extensively in the Great War. It is less deadly than the lung irritants but it has greater casualty-producing power because of its action on the skin. The current phrase describes this effect of mustard gas on the skin as a "burn" and indeed it is treated as a burn and heals as a burn. But it is not a burn in any ordinary sense. If mustard gas, which is liquid normally, is applied to the skin it causes no more sensation than any other liquid of similar properties, say a light motor-engine oil. Only after some hours does erythema, followed by blistering, show itself. The vapour has the same delayed action whether applied to the skin (in the case of clothing being contaminated with drops of the liquid and giving vapour off between clothes and skin) or whether breathed into the lungs, where it produces the same kind of inflammatory destruction. If there is much vapour of mustard gas in the air, the eyes become inflamed as the skin does, but the proportion of serious injuries and partial or complete blindness is uncommon. There is always delay in the onset of symptoms after exposure to mustard liquid or vapour and it is this insidious character which makes it such a potent casualty-producting agent.

Mustard gas is generally a difficult thing to deal with. It is a stable chemical substance, dichlorodiethyl sulphide by name, an oily, dark-coloured liquid in its ordinary commercial form, giving off a vapour at ordinary temperatures, but only evaporating slowly so that if discharged on the ground it persists for a long time and on metal or impermeable stone for weeks. Mustard is also a penetrating substance. It is readily absorbed by everything except metal, glass, porcelain, or a specially prepared surface of oilskin or certain chemical paints. On the skin it is absorbed as readily as is ink by blotting paper because although almost insoluble in water it is readily soluble in the fats of the body. It is also readily dissolved by paraffin, petrol and alcohol. Any food on to which mustard liquid falls or which is exposed to mustard vapour rapidlv absorbs it and if eaten subsequently gives rise to the characteristic mustard inflammation of any and every part of the digestive tract which it reaches. There is no immunity to mustard gas, one exposure indeed markedly increases sensitivity and for a period of years, and the poison is also cumulative. Exposure to comparatively small doses of vapour, for example, over a period of a week as under conditions in trench warfare will give rise to skin, throat and eye trouble.

This means shortly that every person exposed to mustard liquid on the skin or clothing or to mustard vapour in sufficient concentration in the air will, if unprotected, become a casualty. And as the mustard liquid is persistent, it will, even if it has soaked into the ground, or into a wood floor or into brickwork, continue to give off vapour until the whole of it is slowly evaporated. Mustard gas, therefore, presents the doctor with two major problems: the problem of treatment of affected persons and the problem of prevention of further casualties by removal or destruction of the mustard liquid discharged on to any material object. There is one quality of mustard, however, of which advantage can be taken in treatment. Mustard liquid on the skin is not absorbed at once, it takes about five minutes to penetrate the epidermis. And mustard liquid on the clothing takes about twenty minutes to penetrate it and to produce a poisonous vapour between clothing and body. If, therefore, an individual whose skin is sprinkled with mustard liquid drops can have those drops removed within five minutes or if his clothing has been sprinkled remove the whole of his clothing from top to toe within twenty minutes, then that person will be prevented from developing mustard lesions. But the time is short. There is no space here to go into the question of the diagnosis or detection of mustard, its indefinite smell of garlic or onions or horse-radish, its effect on chemical test paints or of its use in bombs or in the form of a spray from a special spraying tank of an aeroplane, but at a time of air attack it may be assumed with practical certainty that mustard will be used.

Measures must therefore be taken to deal with possible large numbers of mustard gas cases at first-aid posts where "anti-gas" treatment for individuals, that is removal of mustard from the skin and decontamination treatment for clothing can be given at once. Quite clearly, however, it will be a great advantage to everyone, in view of the time limit for preventive treatment being so short, if anti-gas treatment (that is, removal of mustard from the skin) and decontamination treatment of clothing can be performed by the individual at home.

Mustard liquid should be removed from the skin by (i) dry swabs of cotton-wool applied vertically to the surface, all wiping being avoided and a separate piece of wool being used for each small area, (ii) dabbing off areas so cleared of obvious mustard liquid by cotton-wool dipped in surgical spirit (or paraffin or petrol in an emergency) so as to dissolve any mustard not removed by the dry swab, (iii) rubbing into the cleansed area a cream (bleach cream) made by mixing bleaching powder and water together in such proportions as produces a creamy application. The swabs used to absorb mustard must be placed in a tin with a tight-fitting lid until they can be burned. The bleach cream should be left in contact with the skin for one minute and then removed by washing off with water. If available, protective ointment, as recommended by the Air Raid Precautions Department, and which will be supplied to first-aid dressers, stretcher-bearers and A.R.P. doctors, can be used instead of bleach cream and must be removed by wiping off with a dry rag. In any case of mustard gas on the skin, the eyes should be washed out with plain water as a routine. Any patient with mustard liquid on the skin will also have it on the clothes although there may be cases of persons with contaminated clothing in which the bare skin is not affected. All contaminated clothing must be removed, hat, outer clothes, underclothes and boots or shoes and the whole body washed over with water. If there is any suspicion of penetration of mustard to the skin, bleach cream must be rubbed in and washed off after one minute's application.

The governing consideration is that of time. Anti-gas treatment must be given within five minutes of the mustard reaching the skin. Decontamination treatment must be given within twenty minutes. Contaminated clothing when removed continues to be a source of danger. It should, if possible, be placed in a dustbin-like container with a close fitting lid. If nothing is available, put outside in a yard or garden and cover over with other clothes, old blanket or otherwise.

Treatment based on these principles will be given at first-aid posts and decontamination centres, but the more people who understand how to do this for themselves the better for them and the better for all concerned, as congestion at first-aid posts will be avoided.

# THE DIAGNOSIS AND TREATMENT OF POISONING

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THE term "poisoning" includes the toxic effects on the body of poisons of all kinds, excluding those due to natural causes (auto-intoxications) or known pathogenic infections accidentally incurred.

The great advances made in recent years in chemistry, both organic and inorganic, have led to the introduction of an enormous number of new compounds. Many of these have been added to the already long list of therapeutic remedies and, though their toxic effects on animals and to some extent on human beings have been tested experimentally, it is well to remember that abnormal sensitivity is often displayed by persons possessing an unexpected idiosyncrasy.

It is necessary to be alert and watchful in the use of new drugs and on the first exhibition of any toxic effects their use should be abandoned before dangerous symptoms develop.

The great developments in industry have proceeded *pari passu* with advances in scientific research, and with new discoveries. As a result of this, industrial workers are often exposed to toxic results of a new kind the symptomatology of which is scarcely known. It is necessary therefore for the medical practitioner to have an open mind when treating patients who have been exposed to such risks, and carefully to record the complex of symptoms which are presented in case they may be the risks of some new form of poisoning.

Examples of this are poisoning resulting from exposure to lead tetra-ethyl, diethylene dioxide (dioxan) vapour, nickel carbonyl and methyl chloride when the early cases led respectively to a complex of symptoms the cause of which was not at first recognized.

## GENERAL CONSIDERATIONS

*Poisoning* may be:—

(1) *Accidental*, due to the accidental swallowing of a poisonous

substance, or to unintentional exposure to some poisonous gas, or the aerial contamination of some noxious substance or fumes. In the case of persons who are allergic or have a special idiosyncrasy the normal doses of some therapeutic remedy may give rise to serious poisoning. "Food poisoning" due to the accidental contamination of food by organisms of this group of bacteria is by no means uncommon in this country. Many recent instances have given rise to medico-legal investigation and civil actions for damages.

(2) *Suicidal* poisoning may be the result of wilful exposure to a toxic risk, for example, carbon monoxide poisoning in the form of coal gas or even the exhaust fumes of a motor car with the engine left running. In suicidal cases, unless definite insanity exists, the poison selected is usually one which has the repute to the person taking it of being a poison. This is an important point because some selection may be made so that the effects of the poison may be as painless as possible. A suicide with no knowledge of therapeutics may select some crude poison which is easily available, such as hydrochloric acid, oxalic acid or a disinfectant like carbolic acid or lysol —all of these cause intense pain and suffering.

A person with some knowledge of the action of poisons would more likely select some narcotic poison, such as coal gas, morphine or one of the well-known hypnotic drugs. The selection of a relatively harmless poison such as aspirin, taken in doses of several hundred grains, of which there have been recently several examples, indicates a great mental unbalance.

It must not be too readily assumed in the case of poisoning by large doses of a hypnotic drug, such as one of the barbiturate compounds, that the intent was suicidal. It is well known that these drugs may produce amnesia as an early symptom, and several doses may be repeatedly taken during the stage of forgetfulness preceding actual coma. The term "temporary insanity" as applied to suicide by poisoning is with advantage dropped in favour of the term "during a period of mental unbalance." In the case of persons suffering from definite insanity remarkable types of poisoning may occur such as the swallowing of broken glass, matches, and small nails.

(3) *Homicidal* poisoning is fortunately very rare in this country, and when instances do occur much publicity and interest are aroused. In tropical countries homicidal poisoning is by no means uncommon, such poisons as compounds of arsenic or mercury and vegetable poisons of the solanaceæ or strychnos group being often selected.

### MEDICO-LEGAL IMPORTANCE OF POISONING

Whenever poisoning of any type is diagnosed or suspected the medico-legal aspects must be prominently borne in mind. Suicide and homicide come under the criminal law, and medico-legal investigations are unavoidable. In the event of "accidental" poisoning civil responsibility may arise in many cases. It is necessary therefore that clear proof of the cause of the poisoning and of everything attached to it should be obtained and carefully recorded at the time of observation. Notes made at the time may be required for production when giving evidence.

### DIAGNOSIS OF POISONING

*History.*—Careful attention should be given to every detail of the history of the events preceding the onset of poisoning or suspected poisoning and these should be critically examined. The habits and psychical history of the person affected are important. It is often difficult to obtain a clue to the nature of the poison taken and perhaps the mention of some popular name of a poison such as spirits of salts, salts of lemon or the description that the poison to which the person was exposed was like chloroform or ether may be helpful in diagnosis. The explanation of the patient or his friends as to the possible cause of the symptoms of poisoning should be asked for and carefully considered as a possible cause. Often some clue may arise in this way. For example, the first case of toxic jaundice which resulted from poisoning by the vapour of cellulose varnish used for the wings of aeroplanes was sent to St. Mary's Hospital Out-Patient Department as a case of "catarrhal jaundice" in August, 1914. On careful inquiry the patient said he had been using a varnish, which smelt like chloroform or ether, and had been exposed for many hours daily to the vapour of this liquid. It was evident from clinical examination that this was a case of toxic jaundice and the patient subsequently died of acute necrosis of the liver. Subsequent investigations showed that the varnish known by the workers as "dope" contained about 20 per cent. of tetrachlorethane. On visiting the aeroplane factory it was found that most of the workers exposed to this vapour were suffering from hepatic disturbance and many of them had early jaundice. Indeed many other fatal cases of toxic jaundice and hepatic necrosis occurred amongst workers in aeroplane factories who had been exposed to the vapour of tetrachlorethane. The diagnosis of the cause of the toxic jaundice, viz. tetrachlorethane poisoning (the clue to which had been given by the patient himself) was confirmed by animal experiments with each of the constituents of the cellulose varnish. This knowledge led to the adoption of measures which prevented further occurrences of poisoning among the workers. Subsequently chemical research discovered a non-poisonous solvent of cellulose (amyl acetate) which was substituted for tetrachlorethane in the varnish and the possibility of poisoning from this cause was removed.

*Circumstantial evidence* is important and must receive close attention. Thus any drugs or medicines which might be associated with the cause of the poisoning should be sought for and carefully preserved for subsequent investigation. Any prescriptions should be examined, and any vomit or excretion set on one side, labelled and safely kept for analysis. The statements of persons who can give from first-hand knowledge any clue to the cause of the poisoning should be recorded at the time. Any letters or documents which may throw light on the subject should be examined and carefully kept.

### ADMINISTRATION OF THE POISON

This is usually by the *mouth*, but the possibility of other modes of entrance must be borne in mind. If taken by the mouth the time of the onset of symptoms is important and is usually short in acute cases. In chronic poisoning such as occurs with lead, or the liver poisons such as trinitrotoluene, cinchophen derivatives, the onset of poisoning may be delayed for weeks or months. The occurrence of other cases among persons who have been exposed to the same risk is important, though here idiosyncrasy may play a part and only those susceptible be attacked.

Recently in an institution where five persons were given what was thought to be aperient tablets, within half an hour all suffered from acute irritant poisoning, severe pain, vomiting and diarrhœa. Investigation at once disclosed the fact that mercuric chloride tablets had been given in mistake. Within two hours active treatment was commenced and as a result all the patients made a complete recovery. This illustrates the importance of prompt diagnosis and treatment. In bacterial food poisoning sometimes one person may be severely affected, others escaping entirely.

*Absorption by mucous membranes.*—Rectal or vaginal administration must be borne in mind as a cause of poisoning since rapid absorption may occur thereby. Mercurial poisoning from intra-uterine douches is well known.

Alkaloids are rapidly absorbed by the rectum, and the rectal administration of morphine or opium preparations requires care. Recently a case came to my notice in which acute mental symptoms, delirium and hallucinations had developed from an unknown cause. Acute dilatation of the pupils and an erythematous rash were present. These symptoms were found to be due to atropine poisoning from the inadvertant administration of belladonna ointment per rectum.

*Conjunctival* administration may in susceptible persons give rise to poisoning. I have seen hyoscine poisoning occur in a susceptible person from the use of a solution of hyoscine in the form of eye drops.

*Urethral* administration may lead to rapid absorption. The use of strong solutions of cocaine for urethral injection is often attended with danger. Cases of sudden acute and fatal poisoning associated with convulsions, coma, and cardiac failure have occurred.

*Absorption by the skin* occurs with some poisons. This danger must be borne in mind in the use of external application. Chysarobin for example may give rise to generalized erythema and toxic symptoms, with albuminuria in susceptible persons. I have seen belladonna poisoning arise from the external application of belladonna liniment in susceptible persons. Lead tetra-ethyl is a volatile liquid which is readily absorbed by the skin and gives rise to acute and dangerous cerebral symptoms. Some fatalities occurred amongst the early workers engaged in the manufacture of this substance, death occurring from acute maniacal symptoms. Lead tetra-ethyl has been largely used as an addition (1 in 1,300) to petrol for motor use because of its property of preventing "knocking." A special departmental committee reported in 1930 on the use of ethyl petrol, and showed that no danger attached to its use as a fuel in motor cars, but special precautions were laid down to prevent poisoning from skin absorption by those responsible for the handling of the undiluted lead tetra-ethyl in the process of mixing it with petrol.

*Subcutaneous administration.*—In this method the poison is so rapidly absorbed that the only possibility of retarding absorption is by the immediate application of a tourniquet or by incision and cupping.

*Administration by inhalation.*—The action of poisonous gases and fumes will be considered separately. It is well known that rapid absorption occurs from the mucous membranes of the respiratory tract. Alkaloids, such as cocaine and atropine, are rapidly absorbed if administered in the form of fine sprays in solution. Adrenaline, pituitrin, ephedrine act rapidly when administered in this manner.

This channel of administration is one of the chief factors in the causation of industrial lead poisoning and special preventive measures have been adopted in consequence.

Drug addiction from absorption by the nasal mucous membrane of cocaine or heroin is well recognized. In Egypt the use of heroin in the form of snuff became such a common cause of addiction that special preventive measures were undertaken by the Government.

## TYPES OF POISONING

These must be remembered in searching for a diagnosis. The classification of poisons for clinical purposes is difficult, and can only be made as a rough guide in searching for the cause.

*Mechanical irritants* such as glass in fragments and metallic filings are sometimes used as poisons in uncivilized communities. In this country alleged poisoning by glass sometimes occurs when some soft food such as ice cream is eaten and is said to contain broken glass which has accidentally found its way into the prepared food. Claims for compensation occasionally occur in such cases. For proof of diagnosis in addition to alleged clinical symptoms of gastro-intestinal irritation, clear radiological evidence of the presence of mechanical particles in the alimentary tract would be necessary, and such examinations should always be made.

*Corrosive poisons,* such as the mineral acids and alkalis, carbolic acid, oxalic acid, mercury chloride, and zinc chloride, act by virtue of the strength of solution being such as to destroy the tissues with which they come in contact. Search should be carefully made for any signs of local injury to the skin around the mouth or to the mucous membrane of the mouth or nasopharynx.

The signs of œsophageal, gastric, and intestinal irritation will be acute and obvious if any poison is swallowed and blood will be found in the vomit and excreta.

*Irritant poisons* include the corrosive poisons so diluted that corrosion does not occur, also the very large group of metallic irritant poisons, such as compounds of arsenic, antimony, mercury, zinc, lead and copper, and many organic poisons, such as the phenol group, and oil of savin, cantharides, also one must include here the pathogenic bacterial infections causing food poisoning.

*Poisons which act after absorption into the system and thereby produce their toxic effects on the different organs of the body.*—This includes the majority of poisons and a classification might be made according to their pathological effects, e.g. *narcotic poisons* which act on the brain such as the various narcotic alkaloids, morphine and its derivatives cocaine, atropine, hyoscine.

The large number of hypnotic drugs such as the barbituric acid derivatives.

The drugs used for general anæsthesia, metallic poisons such as thallium acetate and lead ethyl.

*Inorganic poisons* such as alcohol.

*Poisons acting on the spinal cord and peripheral nervous system*, such as strychnine, brucine, manganese, lead, mercury, alcohol, ergot, and lupines.

*Poisons acting on the liver*, such as the paraffin halogen compounds (chloroform, carbon tetrachloride, trichlorethylene, tetrachlorethane).

The cinchophen group.

Arsenobenzol derivatives, trinitrotoluene.

*Poisons acting on the lung* such as silica, nickel-carbonyl.

*Poisons acting on the kidney* such as mercuric chloride and many of the liver poisons.

From the above brief and incomplete classification it will be gathered that the *toxic effects of poisoning may be and often are identical with those produced by disease due to common pathological causes.* This statement emphasizes the importance, not only of a careful general clinical examination of all the signs and symptoms in a case of illness in which poisoning may be suspected, but also the *necessity* of confirming wherever possible the diagnosis by *analytical evidence.*

### CLINICAL EXAMINATION

Space will not permit of a detailed account of this. The complete history of the case should be supplemented by a detailed clinical examination of all the symptoms of the body and a careful record of all abnormal symptoms and signs. It is only by this method that a differential diagnosis between common disease and poisoning can be made.

The following case is a good illustration:—

Some years ago I was asked to see in consultation a case of alleged oxalic acid poisoning. The patient, a young unmarried woman of 22, was said to have taken some white crystalline powder and afterwards to have suffered from symptoms of vomiting, headache, followed by amaurosis, stupor, delirium, convulsions, and coma. Examination of the urine showed the presence of a large amount of albumin and casts. The condition was clearly one of uræmia due to an acute toxæmic nephritis arising from natural causes. Venesection and treatment of the renal condition were followed by complete recovery. No oxalic acid was found on analysis, and it was subsequently discovered that the crystalline powder taken was Epsom salts.

In the case of poisoning by barbituric acid derivatives, if a large, possibly fatal, dose be taken, almost invariably within 24 hours pyrexia and consolidation of the lung develop, with the physical signs of broncho-pneumonia. The deep coma and the absence of cough, and typical sputum distinguish this from an ordinary broncho-pneumonia, but the only certain proof that the lung condition is not due to natural causes is the finding of the barbituric acid derivative in the urine.

### ANALYTICAL EVIDENCE OF POISONING

It must be remembered that toxicological analysis is difficult and, owing to the presence of organic material, is full of pitfalls unless undertaken by an expert of great experience. In cases of poisoning during life it must be impressed upon the nurses that all specimens of vomit, stomach washings, urine, and fæces should be carefully set aside, labelled and reserved for analytical examination. The vomit, and first stomach washings will generally reveal evidence if the poison has been taken by mouth within 3 hours. A poison taken by the mouth is gradually excreted by the system and in most cases elimination is complete in about ten days or less.

*The urine* should be carefully preserved and when coma is present a specimen should be drawn off by catheter with proper precautions. Analysis usually reveals the presence of the poison. In the case of arsenical poisoning in which a single dose is taken the percentage of arsenic in the urine on a given day will indicate the size of the dose originally administered. In the Armstrong case the analysis of a specimen of urine indicated that a possibly fatal dose of arsenic had been administered three days previously, and this fact led to the suspicion (confirmed by subsequent analysis) that arsenic had caused the death of another victim (Mrs. Armstrong).

In poisoning by barbitone the substance is excreted mainly in the urine and can be readily detected. Some of the barbituric acid derivatives, such as dial, evipan and luminal, are partly broken up in the body but their presence in cases of poisoning can be determined. Alkaloidal poisons and other absorbed poisons will be found in the urine within three or four days from the time of administration. It is most important that the first few specimens of urine passed after the onset of the poisoning be carefully reserved, since the later specimens may contain little or none of the poison. Careful examination of the urine should be made for any indication of ordinary disease such as the presence of sugar, ketone bodies, albumin, and casts. In acute alcoholic poisoning alcohol in amounts of considerably over 0·1 per cent. will be found within 12 hours.

*Fæces.*—Examination of specimens is of importance particularly in the case of metallic poisoning such as lead.

*Blood analysis* is of importance particularly in cases of coma. About 20 c.cm. of blood may be collected by vein puncture. Blood urea and blood sugar analyses should be made as well as search for any poisons.

*Cerebrospinal fluid.*—In cases of coma a specimen of this should be collected. Barbitone derivatives, alcohol, and many of the alkaloidal poisons may be detected. The fluid should also be examined for any pathological changes, e.g. Wassermann reaction.

*Examination of the hair.*—After suspected poisoning by arsenic, whether acute or chronic, a specimen of the hair should be taken for analysis. Arsenic can be detected by this means months after its administration. The following case is an illustration:—

A Government official in a tropical country consulted me on account of an illness which had given rise to much difficulty of diagnosis. On October 6th, 1922, he was attacked with severe abdominal pain, vomiting, and diarrhœa, watery stools containing some mucus being passed. He was very ill with these symptoms for three days and a good deal of hiccough occurred. On the 9th circumoral herpes developed. The patient remained in hospital until the 30th, when he returned to duty. He now began to suffer from slight cramps in the feet, some numbness and feeling of coldness in the hands and feet, and some weakness of the legs. Marked thickening of the skin of palms and soles occurred, and the skin peeled off here in the middle of November. In consequence of these symptoms the patient came home in November, and he consulted me on December 19th, 1922. Slight anæsthesia to a light touch was found in the hands and feet, and some thickening of the skin of the palms and soles was clearly present. The patient consented to some of his hair being removed for purposes of analysis, and Dr. Roche Lynch kindly submitted this to the electrolytic Marsh-Berzelius test. A considerable amount of arsenic was found in the hair, 1/22 of a milligramme in 3 grammes of the hair.

The diagnosis in this case was clearly that of acute arsenical poisoning on October 6th, 1922. In reply to my question, the patient told me that there had been considerable trouble on the 6th on account of the misbehaviour of his native cook, who was discharged from service on the following day. The explanation of the source of the arsenical poisoning does not appear difficult of comprehension. This case is of great interest, since by reason of the knowledge of the mode of excretion of arsenic a diagnosis of acute arsenical poisoning could be definitely made as long as ten weeks after the poison had been administered.

### FATAL POISONING

When death occurs after suspected poisoning the case is reported to the Coroner who will issue an order for a post-mortem examination. In former days this often contained a clause ordering in addition to the post-mortem examination an analysis of the stomach contents. At the present time it is recognized that any chemical analysis required will be entrusted by the Coroner to a specially appointed expert.

The pathologist will, however, reserve for analysis in separate clean vessels the stomach, intestines, urine, liver, kidneys, and spleen duly covered, sealed and labelled. If arsenic is suspected portions of the hair and nails should be reserved. In suspected metallic poisoning, such as lead, a piece of the femur should be reserved for analysis. No preservative should be added.

### MORBID PATHOLOGICAL AND HISTOLOGICAL EVIDENCE

Chemical analysis may reveal the presence of the poison which has caused death, but valuable confirmation of the toxic agent can in many cases be obtained by the macroscopic and histological changes in the organs at necropsy. The degenerative changes produced in the liver, kidneys, and other organs by most of the common poisons have been so carefully studied and are so well known that confirmation of the diagnosis may be forthcoming in cases in which, owing to elimination of the poison chemical analytical proof is impossible.

### CO-RELATION BETWEEN CLINICAL SYMPTOMS AND ANALYTICAL FINDINGS

Complete proof of the diagnosis of poisoning requires when possible the confirmation of the clinical diagnosis by the analytical results, bearing in mind the rate and mode and excretion of the poison after its ingestion.

### AFTER EFFECTS OF POISONING

A poison taken into the system may, without causing immediate fatal results, yet effect such damage to important organs that death may result later when all the poison has been eliminated from the system. The period for practically complete elimination is about 14 days.

In the case of many of the liver poisons such as cinchophen, trinitrotoluene, tetrachlorethane, and arseno-benzol derivatives, a progessive hepatitis may occur associated with toxic jaundice and terminating in acute necrosis of the liver weeks or months after the cessation of exposure to the poison. In such cases analytical confirmation would not be forthcoming.

The diagnosis would rest on the characteristic course of the clinical symptoms coupled with the history of exposure to the poison on question and confirmed by the morbid anatomical and histological changes found post-mortem.

In the case of phosphorus poisoning the poison is rapidly eliminated and oxidized and, if death is delayed for a week or more after exposure, it would at that stage probably be impossible to have confirmatory evidence by chemical analysis; the pathological changes, however, would be typical.

There are many poisons, such as alcohol, thallium acetate, ergot, mercuric chloride and manganese, in which permanent and ultimately fatal damage to the organs of the body persists long after the elimination of all traces of the poison.

### BACTERIAL FOOD POISONING

This is associated clinically with the symptoms of acute gastro-enteritis and possibly skin rashes following within a few hours of the taking of contaminated food. It is important in such cases that bateriological confirmation of the diagnosis be obtained if possible. Thus specimens of fæces should be examined for organisms of the food poisoning group such as *B. ærtrycke* or *B. enteritidis* of Gærtner. Blood agglutination tests with this group of organisms should be made at intervals of two or three days, on three or more occasions. Evidence of this type will be required should any civil legal action be taken.

## THE NORMAL OCCURRENCE OF TRACES OF LEAD AND ARSENIC IN THE URINE

*Arsenic.*—Recent researches have shown that arsenic may be present in the urine of normal persons up to amounts of 0·1 part per million or even slightly more than this. Arsenic occurs naturally in certain food stuffs, such as fish (plaice, sole, cod, turbot), and in shell-fish such as oysters and lobsters, in harmless organic form and the consumption of such foods may give rise to the presence of traces of arsenic in the urine. The finding of such minute amounts of arsenic should not alone lead to a diagnosis of arsenical poisoning unless there is ample confirmatory clinical evidence, and analytical evidence of much greater magnitude.

*Lead.*—Special researches conducted in this country by the experimental staff of the Ethyl Petrol Committee have shown that lead is usually present in normal urine in amounts up to 0·05 parts per million. The diagnosis of lead poisoning often arises in connection with claims under the Workmen's Compensation Act. For positive analytical evidence of lead poisoning amounts much greater than this would be required.

## THE TREATMENT OF POISONING

*Prevention* of any possible exposure to poison should always be ensured. This applies especially to persons suffering from industrial poisoning of any kind, and also to cases of drug addiction, or the persistent taking of hypnotics or harmful medicines.

*ACUTE POISONING FROM ORAL ADMINISTRATION.*—It must be remembered that apart from the local effects of corrosive or irritant poisons the real danger lies in the toxic action of the poison on the organs of the body after its absorption in the gastro-intestinal tract. Every effort therefore should be immediately directed to eliminate the poison from the alimentary tract and so minimize its absorption as far as possible.

In the case of corrosive poisoning in which local damage to the œsophagus or stomach has occurred it would be unsafe to pass a stomach tube. In such cases antidotes, such as well diluted harmless acids (vinegar, lemon juice, tartaric or citric acid) may be given to neutralize caustic alkalis. When corrosive acids are taken harmless alkalis, such as sodium bicarbonate, magnesium oxide or carbonate, lime water, calcium carbonate, may be given freely. White of egg in large quantities is useful in the case of corrosive metallic compounds. In the case of oxalic acid or oxalate poisoning large quantities of lime water or saccharated lime water mixed with chalk are an effective antidote and should be at once given. This method of treatment is also valuable in poisoning by carbolic acid, lysol, and phenol derivatives. In corrosive poisoning and acute irritant poisoning the pain is so intense that full and frequent hypodermic doses of morphine are imperative.

*Gastric lavage* in most cases should be given with the least possible delay. The earlier it is given the greater the chance of recovery. Normally the stomach contents are passed on to the intestine in about 3 or 4 hours but in narcotic poisoning the gastric emptying is delayed so that if the case is seen within 8 hours of the taking of the poison gastric lavage is advisable. Simple emetics, such as salt or mustard mixed with water, may be given preparatory to gastric lavage if the patient is not comatose. Irritant emetics, such as zinc sulphate, copper sulphate or ipecacuanha, are best avoided. Apomorphine hypodermically in emetic doses is such a dangerous cardiac depressant that its use is inadvisable.

For gastric lavage a soft stomach tube to which is attached by a glass junction 4 feet of rubber tubing with a funnel should be used. It is important to ensure that the stomach tube is actually in the stomach before lavage is commenced. I have seen recently two cases of barbituric acid poisoning in which such an intense spasm of the upper opening of the œsophagus was present that the stomach tube went down the larynx and trachea instead of the œsophagus; indeed in these cases passage of the stomach tube was impossible. When it is certain that the stomach tube is actually in the stomach, lavage with several pints of warm water should be carried out. In the case of alkaloidal poisoning, such as morphine, heroin, cocaine, atropine or other easily oxidizable alkaloids, a weak solution of permanganate of potassium should be used since this oxidizes the alkaloids to harmless compounds. Gastric lavage may be repeated after two or three hours to remove any regurgitant fluids.

*Colonic lavage* is of value in eliminating poisons from the intestine and should be given every 8 hours after thorough gastric lavage has been effected.

In the case of poisoning by carbon monoxide, hydrocyanic acid and any respiratory poisons oxygen mixed with 5 per cent. of carbon dioxide should be administered by a special mouthpiece. This ensures free lung ventilation and stimulation of the failing respiratory centre, as well as promoting the elimination of poisonous gases or vapours present in the blood by increasing its oxygen content.

*Artificial respiration* by the Sylvester method should be employed in addition if there is not adequate response of respiratory movements to oxygen and $CO_2$.

*Lumbar puncture and cisternal drainage.*—In narcotic poisoning the cerebrospinal fluid has been shown to contain the poison. A paper by Sir James Purves-Stewart and myself (1934) called attention to the great value of this method of treatment in coma from barbitone compounds. By this method of drainage some of the cerebrospinal fluid is removed with its contents of poison. The methods of elimination of the poison by gastric and colonic lavage already carried out should have eliminated further absorption of poison from the gastro-intestinal tract and thus the blood should have become free from poison. The cerebrospinal fluid excreted at this stage to replace that drawn off would therefore be expected to be free from poison, and thereby assist the recovery of the nerve centres from the toxic effects. It is certain that in cases of pneumonia resulting from barbituric acid poisoning the removal of cerebrospinal fluid in conjunction with other methods of treatment causes in many cases the rapid subsidence of the pneumonic symptoms and gives a good chance of recovery in cases that would otherwise be certainly fatal. It is unnecessary to state that cisternal puncture should only be performed by one experienced in this operation.

In cases of coma resulting from narcotic poisoning the pressure of the cerebrospinal fluid is usually considerably above normal and the fluid may be withdrawn until the pressure becomes normal which may be shown by the manometer reading or by a normal rate of flow. Lumbar or cisternal puncture may be repeated every 8 or 12 hours if the coma persists.

The method is applicable to all forms of coma from narcotic poisoning. I have found it of great value in the early stages of liver poisoning, in which there were signs of commencing coma resulting from the great impairment of liver function (hypohepatism) due to such toxic liver poisons as chloroform and its allied compounds, arsenobenzol derivatives, and phosphorus. In these cases the central nervous system is being poisoned by the toxic substances in the blood resulting from the defective liver function.

*GENERAL METHODS OF TREATMENT IN COMA FROM NARCOTIC POISONING.—Cardiac and respiratory stimulants*, such as atropine, camphor, strychnine, coramine, adrenaline, and digitalis preparations may be given hypodermically and repeated as required. Excessive doses of strychnine, or coramine have been advocated by some writers but in severe cases of coma such treatment is of little value and is like flogging the tired horse.

*Administration of saline and glucose* intravenously or by the drip method is often very helpful.

*Administration of oxygen or oxygen with* $CO_2$ intranasally may also be employed.

*Feeding* in cases of prolonged coma is important. Glucose, peptonized milk, coffee and milk should be given 8-hourly in quantities of 15 or 20 ounces by the stomach tube. In cases of narcotic coma every effort should be made to maintain the strength of the patient in the hope that his nerve centres may recover from the toxic effects to which they have been submitted. In young patients with good physique and vitality success is often achieved, but in other cases, in spite of unremitting efforts, response may not be forthcoming and prognosis should be guarded.

*Physiological antidotes* are of value in suitable cases and may be given with care and watchfulness in full doses. Thus in poisoning by the mydriatic alkaloids, atropine or hyoscine, one may give hypodermically pilocarpine nitrate and when there is delirium and restlessness morphine may also be given. Similarly in poisoning by morphine and its derivatives full doses of atropine may be given hypodermically.

*POISONS ACTING ON THE LIVER AND KIDNEY.*—These organs often bear the brunt of the attack and suppression of their function results. The treatment of the case after the adoption of methods to remove the poisons from the gastro-intestinal tract, consists in the careful and energetic treatment to restore the function of the damaged organ.

*Liver poisons.*—It is well known that the liver cells are much more resistant to toxic effects if they contain stored glycogen. Prophylactic administration of glucose—1 oz. or more in coffee or fruit juice by mouth 3 or 4 hours before the administration of some toxic drug such as an anæsthetic, or an arsenobenzol derivative intravenously, is undoubtedly a valuable preventive of the occurrence of toxic symptoms.

The early symptoms of failure of liver function should always be carefully looked out for, because the sooner active treatment is employed the greater the chance of recovery. These symptoms are nausea, vomiting, furred tongue, headache, restlessness, mental irritability, twitchings of the muscles, delirium, and stupor. At this stage slight jaundice may be present, shown by the icteric tinge of the skin and sclerotics. A blood test will show a raised icterus index even if jaundice is not apparent. These signs as soon as recognized are the indications for active treatment.

Glucose should be given freely by the mouth and per rectum. Saline and glucose may be given subcutaneously or intravenously. The drip method may with advantage be used for rectal and intravenous administration. Alkalis such as potassium citrate 30 gr., sodium citrate 60 gr., bicarbonate of sodium 30 gr. doses may be given by mouth every two hours. Calcium chloride 1 per cent. solution of the crystallized salt may be given daily in doses of 10 c.cm. intramuscularly, or calcium gluconate 10 per cent. may be given similarly in doses of 10 c.cm. Parathormone in doses of 10 units may be given subcutaneously in conjunction with the calcium injection. A preparation of liver extract suitable for hypodermic use may be given subcutaneously daily in normal doses. The food given by the mouth should be such that no strain is thrown on the liver metabolism, thus diluted fruit juices, raisin tea, whey or even simply glucose and water flavoured with lemon or grape-fruit juice. It is remarkable how often symptoms of threatening hepatic necrosis may be arrested and warded off by the early energetic treatment on the above lines.

When the symptoms are more pronounced and coma with perhaps convulsions have supervened, lumbar puncture is advisable, and this may be repeated 8 hourly, the amount of cerebrospinal fluid drawn off depending on the pressure and rate of flow after puncture.

The above line of treatment is of great value when there is threatening of arrest of hepatic function, and I have seen many apparently hopeless cases recover when continued and active treatment has been patiently persisted in.

*Kidney poisons.*—In some cases of poisoning the renal function fails and suppression of urine may last for several days. During this period the blood urea content gradually rises and may reach as high a figure as 300 or more. In such cases early clinical symptoms of uræmia, such as nausea, vomiting, restlessness, muscular twitchings, Cheyne-Stokes breathing, stupor, and delirium, must be carefully watched for.

Suppression of renal function is common after mercuric chloride poisoning, and has been described by me in carbon tetrachloride poisoning by inhalation and in barbiturate poisoning, indeed it may occur after many poisons which act by the toxic effects on the tissue cells. In one case of poisoning by mercuric chloride seen by me, when 51 grains were taken accidentally, only 8 ounces of urine were passed in the following six days. In a case of poisoning by carbon tetrachloride vapour recorded by me (1934) complete suppression of urine occurred for ten days. Both of these cases made a complete recovery. The treatment of such cases resolves itself into treatment of the renal condition. Nothing is given by mouth which will throw any strain on the kidneys.

The diet consists of water, diluted fruit juice, and glucose. Saline and glucose are given per rectum. Alkalis, such as potassium citrate and sodium bicarbonate, are given by mouth. Glucose and hypotonic saline are given intravenously, by the drip method in preference. Skin action is promoted by mild heat, such as the radiant heat from electric light radiation, coupled with minute doses ($\frac{1}{20}$ grain) of pilocarpine nitrate, hypodermically. Diuretics, such as hypodermic caffeine sodium benzoate, may be given, but it is inadvisable to give any toxic diuretics such as the organic mercurial compounds often used for diuretic purposes. Should uræmic convulsions occur venesection would be advisable.

By careful and persistent treatment on the above lines often the reward is attained of the reappearance of the renal function, and when urine begins to be excreted the daily amount passed rapidly rises and with this a subsidence of the blood urea content and the disappearance of the toxic uræmic symptoms.

## CONCLUSION

The treatment of poisoning resolves itself into (1) the adoption of measures for counteracting the immediate effects of the poison and its removal from the alimentary tract before absorption; (2) the treatment for the restoration of physiological function of the organs damaged by the absorption of the poison. This treatment should be planned on physiological lines after calm and considered judgment, and care should be taken that no remedies at this stage should of themselves have an added toxic effect on the already damaged organs.

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# THE SUICIDAL IMPULSE AND THE VALUE OF PSYCHOLOGICAL TREATMENT

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## INTRODUCTION

THE problem of suicide presents many facets, with a corresponding number of differing points of view. The considerable consensus of opinion in connexion with the prophylaxis and treatment of suicide therefore calls for remark. Medicine almost inevitably regards them as of the first importance; its position as the healing art forbids the neglect of an individual whose wish for death alone indicates a serious deviation from the normal will to live. For the individual himself the position may at first sight appear to contradict this view, but only seemingly so. It is comprehensible that a man having selected this means of escape from life's troubles may not welcome, and may even actively repulse, an opposing influence. But this is not the whole story; the patient who visits his doctor shows by this very act some persistence of the life urge.

Significantly enough the common humanity which makes the doctor fan to further life the flame, however small, finds support in the purely social approach: the interrelation which continually takes place between the individual and society in which he lives alone causes the unhappiness of the potential suicide to have a range of action beyond the individual immediately concerned. In addition prevention has a value of its own. The act of suicide may have far reaching and damaging repercussions upon those with whom the sufferer has previously come in contact; reports of suicide also exert a disrupting influence upon society; the power of suggestion enters here.

These considerations in emphasizing the place of matters psychological both in the causation and in the deleterious effects of suicide, in turn suggest the possible value of psychotherapy in the treatment of the suicidally minded. The point at issue is important, yet the extent to which the suicidal impulse is or is not accessible to psychological treatment is still a vexed question. This paper attempts to throw some light upon the subject, taking into particular consideration the medical, the individual, and the social aspects of the question.

## SUICIDE AS A MEDICAL QUESTION

The mode of treatment best fitted to restore to health the sufferer from any form of illness in general or from the pressure of the suicidal impulse in particular depends not only upon the patient and the underlying cause or causes of the complaint but also upon the stage of the illness. In this way when the suicidal urge is so pressing that self-restraint is impossible, psychotherapy as such may not have any place; active steps for the mere preservation of life may be all that is possible for the moment (Achard). But such preventive work, in common with emergency measures in general, is essentially temporary and does not constitute basic therapy: so long as it is in force the life of the patient must still be considered in danger. For the achievement of sound health a change in mental outlook is a therapeutic necessity.

The dependence of the recovery of the suicidal patient upon an alteration in his psychological attitude both introduces the subject of psychotherapy and meets one of the objections to its use, namely that it is in some instances a time-consuming work. For though the absence of the wish for death is an advance, the more positive aim, the active desire for life, should be the final goal. The attainment of such an outlook is not a merely theoretical matter, it has a definite practical value; the interest in life which it implies provides as it were its own fuel. With life well worth the living the mental health of the previously suicidal patient may be considered to rest upon a sound basis.

*Medical attitude to the psychological treatment of the potential suicide.*—Psychological treatment has already achieved considerable success in the reorientation to life of certain individuals previously swayed by the suicidal impulse. The diffidence, even hostility, with which doctors, otherwise favourably disposed, regard psychotherapy when the potential suicide is in question, therefore calls for remark. A right and natural hesitation may dictate this attitude. In serious illness the critical condition of the patient may cause a relatively small error in treatment to produce the gravest consequences. Since suicide constitutes one of the most serious symptoms associated with mental trouble it may well be argued that to employ a mode of therapy the capacities of which are not fully known, may be to court disaster. On the other hand an opposite argument appears to have an equal force, namely that the very gravity of the symptom declares against leaving any stone unturned; an impasse threatens.

Fortunately at this juncture the specialist steps into the breach. His special training, combined with a field of inquiry relatively at once deeper and more limited as compared with the wider field of medicine in general, places him in a position peculiarly favourable for reaching a sound decision on the question. It is in fact dilemmas of this kind, together with a growing appreciation of the many medical problems which require special training and opportunity for their solution, which has led to that increase in specialization which forms such a feature of the medicine of to-day. Many fields of medical work illustrate this tendency. The subject of cerebral tumour alone bristles with interrogations. Diagnosis, at times relatively simple, at others requires specialized help and investigation. The very increase in the therapeutic armamentarium, which for example the modern advances in cranial surgery have created, has given rise to a correspondingly greater need for more exact and well defined diagnosis. In this way a positive diagnosis of cerebral tumour alone no longer suffices; the site and type of growth have also a definite bearing on treatment. Similarly the treatment often intimately concerns the specialist; the need for operative interference calls for the neuro-surgeon. Not that general questions relating to the patient's constitution and total make-up cease to influence therapeutic procedure: the soil and other related environmental phenomenal as well as the seed always enter into the question.

A comparable situation exists in connexion with the problem of suicide. The ever-present need for diagnostic and therapeutic acumen has its basis in a sound knowledge of psychiatry. For instance psychiatric experience draws attention to the symptomatic nature of the suicidal impulse, a point of therapeutic importance. As with other symptoms the suicidal tendency may at times require direct handling. But treatment to be basic must always so far as possible have a causal character; it is therefore pertinent that the recent advances in psychological treatment which the genius of Freud initiated favour the causal approach to mental illness. Not that this avenue has universal application. The extent to which any given patient is or is not accessible to psychotherapy always remains a question for experienced and individual study. Again, broad considerations of personality rather than the narrow aspects of symptomatology govern judgment. The patient's life history, the circumstances connected with the onset of his trouble, and above all the "stuff" of which he is made, are the essential determinants.

At the outset it is certain that psychological treatment is not universally applicable; as already observed psychiatric knowledge and discrimination are always essential. More than this, the many active precautions which are necessary to prevent suicidal attempts in mental hospitals when patients are "under certificate" speak for the inexactness of the common saying that he who speaks of suicide never carries out his threat (Geffen, Meerloo). None the less, like so many popular sayings it contains an element of truth. To speak freely is to ease mental tension: he who speaks of his suicidal inclinations may thereby obtain relief, which may endure for a length of time sufficient for other and more constructive possibilities to make themselves felt.

It is essential therefore that such expression shall give maximum relief of tension, and here the listener must play his part. Mishandling of confidences may render the last state of the suicidal patient worse than the first. To tell such a one to use his will-power, to pull himself together, may meet with immediate apparent success. But too often such injunctions drive the patient more in on himself. Feeling, and to some extent rightly, that he is not understood, he may become embittered and more reticent, both, as already pointed out, serious retrogressions. Very different may be the result when the doctor makes a correct psychological approach (Gruhle, Jamieson). Mistakes have occurred, but these do not in themselves disqualify psychological treatment as a mode of therapy. When a given instrument has proved its value, such error should not lead to its disuse but rather to further investigation. Moreover, such procedure has well recognized medical precedents.

*The importance of a correct approach.*—From the beginning the difficulties of dealing psychologically with the potential suicide are self-evident. The practitioner has not only to deal with an individual who has lost his way in the journey of life but also with one who has a well-defined, even set attitude. Both aspects merit attention. The very hardships and limitations which his mental difficulties impose on development and immediate action show the need for correction. Yet even superficial examination often reveals the relation of a given symptom or symptom-syndrome to an attempt to compensate for some earlier frustration or disappointment (Dreikurs). For this reason alone to disturb any given adjustment before adequate provision has been made for meeting the situation for which the defence was originally provided may result in catastrophe. Too abrupt handling, harsh or merely injudicious treatment of the adaptation already made, may cause not only unnecessary pain, but even serious trauma: it may precipitate the very calamity, namely suicide, which it was the practitioner's aim to avert (Jelliffe and White). Such ill-advised, though well-meaning efforts do in part account for some of the dangers associated with the psychological treatment of the suicidal impulse. More especially where deep and wide experience is lacking does the advice to make haste slowly hold pre-eminently in this work. No hard and fast rules are possible —the ever-present need for bearing in mind the uniqueness of each patient ever remains (Durkheim; Dalmas; Cavan). A judicious balance away from stultifying stereotype and too great laxity is the goal.

## SUICIDE AS AN INDIVIDUAL QUESTION

A knowledge of the path in life along which the patient has travelled, the stresses to which he has been subjected, and the underlying motives which have governed his behaviour form the essential groundwork for a sound conception both of the patient's personality and of his ability to adapt. At first sight the magnitude of these requirements seems to oppose an obstacle to success. Fortunately, however, this information is largely obtained during treatment; it is an incidental as well as an important auxiliary to the work of psychotherapy; for instance the way in which, in addition to present and immediate difficulties, subtle and complex problems also arise whose source lies in the far distant past (Freud; Hadfield).

Since these origins have not only influenced the formation of character but have also exerted a stultifying effect upon development, they obviously deserve attention from the standpoint of therapy. The discovery and understanding of these origins do not depend only upon the conscious help of the physician: their full import often only becomes clear in the course of treatment. For example, in so far as a harmful and and painful incident has been repressed the patient may relive and re-experience it in the course of treatment as though it were of to-day. Such re-experiencing forms an integral part of analytic treatment : to re-experience a situation in an atmosphere more in keeping with the needs of the present enables the patient to correct his previous false impressions. In this way treatment is able to turn to use and to health the very elements which have hitherto been turned to wasteful even harmful count (Jung). The subject of phantasy may illustrate the method of procedure more fully.

*Phantasy.*—Man, to whatever line of human activity we turn, finds happiness and achievement in the exercise of his creative powers. He who possesses imagination needs some outlet for this gift. Its expression in keeping with his needs as an individual both enriches his life and is to some extent necessary for full health. It may assist adaptation to reality in another way. In so far as the products of imagination have a community value they bring social approval. Now, human beings, as their need for community life suggests, have innate social and altruistic interests and wants as well as those of a more strictly individualistic and egoistic nature. In this way social approval may be a real factor in the furtherance of a human being's development.

The advantages do not end here. The products of imagination may have important repercussions upon society as well as upon the individual. The subtle and various interrelations existing between the individual and the society in which he lives render it difficult if not impossible to name a sphere of human activity in which creative imagination has not played some part. The world would be a far poorer place were it not for the vistas which imagination has opened and still does open out. It is significant that the alchemist with his seemingly impractical nostrums and potions, was the forerunner of the modern scientist, of the laboratory worker, regarded by some as the acme of hard materialism.

There is another aspect of the question. In so far as phantasy or imagination is non-productive, an end so to speak in itself, it may well become an enemy not a friend to satisfactory adaptation. A flight from reality, it becomes one of the most serious symptoms with which the medical psychologist has to deal. In much the same way that a lie breeds lies, if it is to be logically maintained, so with non-productive phantasy. The solace which it brings has no solid foundation—it is illusory: worse still it leads the individual away from that real happiness which achievement in the world of people and things brings with it. In the world of non-productive phantasy what is desired is to be had for the wishing, no work, no effort is required—no disappointment, only success is found. But these results have no place in external reality; they exist only in the individual's imagination. It therefore follows that the more a person indulges in non-productive phantasy the more will he tend to associate unhappiness with the world of reality, with a correspondingly greater tendency to avoid contact with the outside world.

It is the work of the medical psychologist to enable the patient to turn such non-productive imagination to productive account; only so will the patient achieve the needs of reality, and with it those of his own personality. It is said that the remedy is often found near the disease—certainly the Willow flourishes in the damp soil which favours the rheumatic diathesis. But here a more remarkable phenomenon occurs, the conversion of the elements of destruction into the work of a construction. The very tendencies, which have hitherto driven their possessor so deeply into the quagmire of unreality that the corresponding fear of reality may ultimately point the way to suicide—now become the stimulating drive to life.

### SUICIDE AS A SOCIAL PROBLEM

The value, even the necessity for turning so far as possible destructive elements to helpful account would seem self-evident. Yet there are people who maintain that it is waste of time to oppose the suicidal tendency. There is danger in the promulgation of such a view. Apart from the untenability of the proposition on general medical grounds it does in fact run counter to the tenets of medicine as the healing art, it also neglects the social aspect of the suicidal problem. The very interrelation which exists between human beings causes the phenomenon of suicide to have an influence beyond the individual immediately concerned (Wexberg). The man who seriously considers suicide is not happy. No matter how carefully he may hide his trouble he cannot have such a constructive and health-producing influence upon others as he who is really whole, i.e. hale and therefore happy as well as efficient. He who is really content contributes, unconsciously though it may be, to the health of his neighbours. The cynic or the disappointed man on the contrary may have a devastating influence.

From the broad standpoint of race the argument falls to the ground. Those who ponder suicide are by no means necessarily poor types (Nicolle). Any one of us may say of them as John Bradford did of the condemned criminal "But for the grace of God there goes John Bradford." Even a superficial knowledge of history illustrates the way in which the prevention of suicide has enriched society. Wagner seriously considered suicide before he accomplished his life's work. Clive made more than one attempt on his life prior to his achievements in India. Modern times present their contributions: Mr. Kobayashi, who is now the head of the Suicide Prevention Society in Japan, had previously made two serious attempts to take his own life. These facts surely have significance.

The wish for death does not always proceed primarily from internal difficulties. In some instances social conditions render rapid death by suicide preferable to a more lingering one, e.g.

by starvation. Wagner considered suicide preferable to an existence hampered by apparently impossible poverty. Ludwig of Bavaria befriended him and so saved him from death.

A knowledge of the facts which promote or discourage the suicidal tendency has therefore a social as well as individual value. The psychotherapist is certainly and rightly primarily concerned with the individual patient he is treating: but the suicidal problem almost inevitably brings to light peculiar problems which circumstances interweaving with the patient's own psychic disposition have created (Carrel; Cattell).

This subtle and persistent interrelation between the individual and the community makes that evaluation of the suicidal patient's personality, which psychological treatment involves, have a wide range of interest. It throws light upon the needs, limitations, and unrealized possibilities of society (Dublin and Bunzel) in addition to those of the patient. In this way experience gained in the discharge of his professional duties acquaints the medical psychologist with the existence of certain remedial ills in the body politic. It may also fit him to offer helpful solutions. As "A Taddygaddy" recently pointed out a doctor may here perform valuable public service.

## CONCLUSION

Consideration of the problems connected with the treatment of the suicidal impulse has led to the conclusion that psychotherapy is the method of choice for certain selected patients. As with other potent instruments, however, the dangers of an incorrect approach are very real. The constructive side of treatment must make its influence felt throughout. Fortunately this therapeutic essential is possible from the onset. The practitioner's approach to the work in no spirit of harsh criticism, but always with the view to the building-up of the patient's health-giving potentialities, performs this service; it helps the patient to that facing of his limitations and other problems which treatment necessitates from time to time. The development of the patient's own personality, together with his increasing insight into the nature of his difficulties, has the same synthetic function. Fitting him to deal more adequately with future problems, courage and a justified self-confidence replace doubt, fear and a sense of guilt.

In this way psychological treatment of the potential suicide adds to the number of people who find life worth while. Since these in the process have become more worth-while people, and the worth of society ultimately depends upon the quality of the units of which it is composed, it follows as a natural consequence that the successful treatment of the suicidal impulse has a social as well as an individual value. The rescue of a potential suicide from an attitude of despair to one of hope and fulfilment alone means the transformation of a centre dissolution to one which radiates health and vigour.

Wider social implications may also enter, for suicide may be symptomatic of a collective as well as of an individual neurosis. Here the medical psychologist, through the information he has obtained in helping the potential suicide to gain a firmer footing on life, may have sound constructive criticism and advice to offer.

The more specifically medical and scientific value of the psychological approach to the potential suicide also deserves mention. While helping the individual and promoting social welfare, the mere doing stimulates the spirit of inquiry and adds to the store of remedial and preventive medicine.

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# URINARY TUBERCULOSIS: ITS SYMPTOMS AND SIGNS

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In man there is an intimate relationship between the urinary and genital organs and it is not uncommon for tuberculous lesions to involve both systems at the same time. It is, however, important to differentiate between tuberculous disease that starts in the urinary tract and extends to the genital organs in a large proportion of cases in men, and tuberculous disease that starts in the genital organs and which may later, in man, involve the urinary tract. The latter is, however, rare and is seen only as a terminal event. These are different diseases running different courses and requiring different lines of treatment. Primary urinary tuberculosis is dealt with here. I have seen only one case in which a lesion in the urinary tract in a woman was associated with tuberculosis of the genital tract.

## GENERAL CONSIDERATIONS

The majority of the patients are between twenty and forty years of age. It is my impression that urinary tuberculosis is extremely rare in children. In four years I have had only three cases in children; and though in all the disease was bilateral when seen, yet in none had symptoms been present for more than a year. In the last six years I have performed nephrectomy only once in a patient under the age of 16. I have seen few cases of the disease after the age of 45, and 60 is the oldest age at which I have performed nephrectomy. Few cases have been seen in which the urinary or the genital tract has alone been affected by the type of disease referred to by Sir James Paget as senile scrofula. The above remarks apply to genital tuberculosis which is not common until the age of 20. I have not come across a case in childhood. That seen about puberty usually runs a very rapid course. The disease is uncommon after 45.

Four per cent. of cases had healed lesions in the bones and joints. Four per cent. of cases had old pulmonary tuberculosis. Here there had been some symptoms to draw attention to the chest and there were definite physical signs. About 20 per cent. had radiological evidence of lesions in the lungs.

The conception of urinary tuberculosis set out in this article is somewhat different from that generally given. In recent years the whole of my work has been done from the clinical aspect and an attempt has been made to grasp certain principles underlying treatment. In conversation with practitioners and those interested in tuberculosis I stress the fact that only rarely does genital or urinary tuberculosis lead to much impairment of health in the early stages. When a patient who has had tuberculosis for a number of years starts to go downhill, and if some fresh lesion is detected the practitioner should put to himself the following question: Is this new lesion just incidental to the act of dying which can take a number of years? If so, it is unfair to put a patient through an examination that causes discomfort, or through a form of treatment that is painful and that at the best can do no more than prolong the act of dying. Consequently I am asked to see patients only if good is likely to result from the consultation. My conception of the disease would no doubt be different were I to urge the carrying out of a complete examination whatever the state of the patient, or to advise treatment on the supposition that the less disease a patient has to contend with the better his lot is going to be. It is my definite impression that when tuberculous disease has been established at one site, secondary lesions in the genito-urinary tract are extremely rare except perhaps as the end draws near. Though attached as urologist to the Glan Ely Sanatorium which has 200 beds and to the South Wales Sanatorium which has 287 beds, I do not see two cases a year in which genito-urinary tuberculosis has arisen whilst the patient has been undergoing treatment. And though these sanatoria have been opened for many years it is rarely that a patient who has once been under treatment there for medical or surgical tuberculosis is referred in later years for genito-urinary tuberculosis.

### THE SYMPTOMS

When the disease is confined to the kidney, there are generally no symptoms. It is often astounding to note the extent of the disease and the few symptoms and the slight impairment of health to which it gives rise. At this stage only occasionally is there hæmaturia, frequency of micturition or pain referred to the lumbar region. Just as a hæmoptysis may precede by many months or even years the development of tuberculosis in the lung, so an attack of hæmaturia may precede the onset of definite symptoms. In one patient there was a history of an attack eighteen months before the disease was detected and there were no symptoms in the interval. In all probability such hæmaturia results from the congestion that the bacilli set up when they are first deposited in an organ. It has been truly said that no hæmaturia should be regarded as essential until the inoculation of a guinea-pig proves that tuberculosis is not present. Hæmaturia, however, is exceptional when the disease is limited to the kidney, and has occurred in only three cases. When the kidney is affected by certain diseases, there is from the first a failure in its power to concentrate urine and, as a result, there is set up some degree of polyuria which by itself leads to slight frequency. This polyuria is increased if there is the slightest back pressure upon the kidney from obstruction in the ureter. Though this polyuria is seen in the early stages of renal tuberculous, not one case has been seen for frequency when the disease is confined to the kidney. Generally there is no renal pain. Occasionally there is a dull ache in the costo-vertebral angle or in the loin; but this has been present in less than 5 per cent. of cases. In two cases the pain was severe enough to be regarded as colic. In one of these the history strongly suggested a stone passing down the ureter.

An electrical engineer, aged 30, gave a history of an attack of pain in the left loin which was very acute, was associated with vomiting, and which lasted half an hour. He had had eight attacks in each of which the pain was a little lower. Finally it became persistent and then disappeared when for the first time there was frequent and painful micturition. It was assumed from the history that a small stone passing down the left ureter had entered the bladder; but cystoscopy showed definite tuberculous ulceration around the left ureteric orifice, and tubercle bacilli were found in the urine. X-ray showed no stone and when the kidney was removed it was found to be extensively diseased and of the hydronephrotic type. The ureter was much thickened down to the pelvic brim.

Such attacks of pain might have been due to caseous material becoming detached and blocking the ureter. But there was no history of anything being passed in the urine which was carefully examined after each attack. As the thickening of the ureter was the noticeable feature at the operation, it was thought that the pain was just evidence of a severe reaction set up in the ureter. But this could hardly account for the severity of the pain or its periodicity. In not one case was pain referred to the healthy side. This is, however, occasionally seen after nephrectomy and results from hypertrophy of a healthy kidney. It is important to warn the patient of the possibility of this before performing nephrectomy. For unless this is done, the onset of such pain leads to the suspicion that this kidney is becoming diseased. It may again be emphasized that so long as the disease is confined to the kidney the symptoms to which it gives rise are often out of proportion to its extent; and none may be present even when the kidney is completely destroyed.

The bladder offers a marked resistance to all kinds of infection, and pus and bacteria may pass over its mucous membrane for years without its becoming involved. Even when this takes place there is always a tendency for the lesion to heal. Consequently though the disease may be active in the kidney there may be no vesical symptoms; but once the bladder becomes affected, marked symptoms arise that are often out of proportion to the extent of the disease. Frequency, pain on micturition, urgency and terminal hæmaturia are now present. One or more of these may arise suddenly and be very severe. But more often the onset is most insidious. The frequency in the early stages is most noticeable at night. Later it is present night and day, and may be so severe as to lead to an active incontinence. This is seen particularly in children. Early on it is the frequency rather than the pain that is disturbing. But later the pain tends to become equally severe.

When the disease involves the trigone, the pain is most marked during and at the end of micturition, and there is a feeling as if the bladder is not completely emptied. Such pain is probably due to the spasm set up by the muscle as it contracts and irritates the congested trigone. In such cases it is not infrequent for the patient to complain that even though urine is passed there is a desire that persists for some minutes afterwards. The trigone seems to be well supplied with nerves and is extremely sensitive. Probably the small ulcers seen here are just as irritable as the tuberculous ulcer that is found at the tip of the tongue. When the disease involves the anterior wall of the bladder, pain may be present when the desire to micturate arises, and is probably due to the fact that distension of the bladder has tended to stretch an irritable ulcer. This pain tends to disappear as urine is passed. Urgency, by which is meant that urine must be passed as soon as the desire arises, is usually present early on. The hæmaturia that now occurs is usually slight in amount consisting of a few drops of blood passed at the end of the act. These are probably squeezed out from the ulcer by contraction of the muscles. Often the symptoms are intermittent and may disappear for months on end. This is no doubt due to the great healing powers that seem to be inherent in the mucous membrance of the bladder. Sometimes it results from the tendency for obstruction to occur in the ureter as a result of which the diseased products no longer enter the bladder. Often the symptoms are aggravated by the administration of hexamine. When this drug is given to a patient and the urinary symptoms become worse, I assume that tuberculous disease is present until it has been proved not to exist. A certain amount of sexual irritability might be expected when the prostate is involved, but none of my patients complained of this.

It should be a fundamental rule with all practitioners that, once any suggestive urinary symptoms arise in an adult, tuberculosis should not be excluded until the urine has been examined for tubercle bacilli, and a cystoscopy performed. The practitioner must not be misled by the fact that the symptoms disappear. For so great is the healing power of the bladder that it is not uncommon for this to happen in the early stages, and it may even occur when the kidney is extensively diseased if the ureter becomes occluded. At times this coincides with an improvement in the general health, and more than once I have put to myself the following question: "If the impairment of health in tuberculosis is due to the absorption of toxins, why is there an improvement once the ureter becomes occluded, and the products that result from the disease are no longer excreted?" The most marked case that I can recall was the following:—

A girl, aged 17, attended St. Peter's Hospital before the war for frequency of micturition that occurred every fifteen minutes. Cystoscopy showed extensive disease of the bladder. The ureter of the supposedly healthy kidney was catheterized on three occasions and pus and tubercle bacilli were found each time, so operative treatment was not advised. Going through the hospital notes after the War, I was surprised to find that she had been admitted and had had her right kidney removed. All her symptoms had suddenly disappeared and cystoscopy now had shown no disease of the bladder. There was no efflux from the right kidney and the urine from the left contained no pus or tubercle bacilli. Here the disease in the right kidney had become shut off and an extensive lesion in the bladder had healed.

### THE SIGNS

When tuberculous disease arises in the lungs it is usually associated with lassitude, loss of weight, night sweats and an evening rise of temperature. Though a slight loss of weight is not unusual, the others are often absent in urinary tuberculosis. More often than not the general condition is remarkably good and there is no preceding history of ill-health. Whenever possible in recent years it has been my practice before performing nephrectomy to send the patient away to a sanatorium. And at the time of the operation the general condition is so good that the comment is often made that it is those about to take part in the operation who look most ill. The healthy appearance of the patient and the absence of malaise has led many a practitioner to believe that tuberculosis of the urinary tract need not be feared when frequency of micturition arises. This is not the case, for such symptoms are so often absent even though the kidney is completely destroyed or the patient is unduly disturbed by frequency and urgency. In few diseases can the symptoms be so severe and yet lead to little impairment of the general health. Their presence in urinary tuberculosis suggests the presence of some secondary infection, that the disease is running a more acute course than usual, that uræmia may be arising owing to destruction of the other kidney, or that some tuberculous lesion is present in some other organ such as the lung.

Whether or not the kidney can be felt will depend upon its position, its consistency, its size and, above all, upon the state of the general health. In the early stages there is no enlargement of the kidney; it occurs if there is obstruction to the ureter. An enlarged kidney that is palpable has been present in 5 per cent. of cases. Not infrequently a kidney that is not palpable at the clinical examination is found to be enlarged when removed at operation. This is what would be expected. For usually the kidney lies so deeply that even when it is enlarged it is not easy to feel if the patient is fat or muscular. I have not infrequently been amazed at the size of the kidney I have failed to palpate. So much depends upon the muscular tone which is often so good in urinary tuberculosis..

Tenderness is rarely found in the lumbar region. When tuberculosis affects superficial structures such as the lymphatic glands there are few signs of inflammation even when the disease breaks down. In such a case tenderness is conspicuous by its absence. There need be no surprise that it is absent in urinary tuberculosis which runs such a chronic course.

Though the ureter at the time of operation is found to be definitely thickened, very rarely can this be detected on palpating the abdomen or on rectal examination. Twice only have I felt the ureter where it crosses the pelvic brim. Once only have I felt it on rectal examination. But in women the ureter passes close to the lateral fornix and on vaginal examination some thickening can be detected in 20 per cent. of cases. Nodules in the epididymis, the prostate, or vesicles are nowadays found in 70 per cent. of the men. A few years back this was the case in less than 50 per cent. This change in recent years in the course run by urinary tuberculosis is clearly related to the changed economic conditions of South Wales.

# AGRANULOCYTOSIS

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MANY practitioners may agree that there is no surer method of diverting attention from a disease than to describe it as "rare" in the context, and I have not so far read an article on agranulocytosis that does not thus invite neglect of a condition which is probably by no means uncommon. I believe that the apparently low incidence of the disease in this country is due, in part at least, to failure to recognize it, and that many cases are diagnosed as "tonsillitis," "septic throat," and "septicæmia." The details of recently recorded cases may have some significance—small series of two and three—suggesting that once familiarity with the disease has been established, other cases which might have passed under a pseudonym are elucidated; thus this article reports three cases which all occurred in the same general practice in the last eighteen months. In most of the really acute and rapidly fatal illnesses the welfare of the patient depends on the diagnostic acumen of the family doctor who has the opportunity of early contact and the onus of decision.

The recognition of agranulocytosis has, during the last fifteen years, spread widely. It attacks both sexes and at all ages, but principally women past middle life, and often terminates fatally. While the essential feature is a great diminution or complete disappearance of the granular white cells of the blood, its most obvious clinical features are ulceration of the mouth or throat, dysphagia, prostration, and fever. A few words on the functions of the leucocytes bear on any discussion of a disease characterized by their absence. In inflammation and infection these cells are believed to be (*a*) phagocytic—ingesting and digesting bacteria; (*b*) the producers of ferments which they secrete and through the action of which liquefaction of dead tissues is brought about. The separation of sloughs is due in all cases to the liberation of a trypsin-like ferment by the leucocytes. The clinical evidence of these activities is seen in the formation and discharge of pus.

### ETIOLOGY

The disease made its appearance coincidently with the dissemination by manufacturing chemists of analgesic drugs containing amidopyrine in some form or combination, and it has been further observed that the ailment was more common in Germany, where it was first reported, and in America—countries in which more indiscriminate usage of these newer drugs was the custom, than in Britain. Furthermore, it was shown that a not inconsiderable proportion of the cases have occurred among the families of the medical profession, or among students and nurses, a class to whom ready access to these newer drugs is assured by the deluge of samples and literature rained upon them. In this way the net was slowly drawn round amidopyrine, but the most conclusive evidence seems to be of John F. Wilkinson and others who showed that even ten grains of amidopyrine produced an immediate fall in the leucocyte count and of Taussig and Schnoebelen that the fall in the leucocyte count preceded the local manifestation in the throat. It has long been known that benzene (a close relation of amidopyrine) produced a leucopenia, and in industrial medicine the diminution of the polymorphonuclear leucocytes is the accepted criterion of chronic benzene poisoning; benzol has been used to reduce the leucocyte count in leukæmia. Although the red cells are also diminished in number by these substances the reduction is to a much smaller extent. While it would seem therefore that the incrimination of amidopyrine rests upon a fairly secure foundation, and further proof of this may be found in a reduction of the number of cases reported as a result of recent legislation, I cannot trace in the literature of industrial disease any description corresponding to the symptoms and signs now associated with agranulocytosis. Moreover, of the millions of people who have taken the drug few demonstrate its toxicity. There must surely be some other contributory factor or inherent susceptibility on the part of the subject afflicted. In this connection S. C. Dyke (1936) draws the analogy of "the change of life" and the incidence of the disease and quotes Jackson and Merrill's case of a woman aged 30 who did not respond to pentnucleotide, but who improved with injections of antuitrin-S. It is difficult to be convinced of the sex hormone factor in view of the wide disparity in the ages of those affected, and on such an hypothesis it is impossible to explain the almost constant affection of the mouth and throat which cannot be a purely fortuitous occurrence. There seems more evidence in support of a vitamin-deficiency factor for the almost sprue-like affinity for the mucous membrane of the alimentary canal, and one at least of my cases (probably two) had been undergoing dietetic restrictions for slimming purposes plus "reducing tablets" (? dinitrophenol). This case also demonstrates the necessity of being alert to the various forms and disguises under which amidopyrine may be presented. There is no clearly established hereditary predisposition though Witts mentions an instance of mother and son with leucopenia.

## CLINICAL PICTURE

The more obtrusive symptoms in most cases are preceded by a rather long prodromal period marked by increasing malaise, lassitude and easy fatiguability. It is impossible to exaggerate the importance of the recognition of this phase of the illness which has been noted by several observers. The correct interpretation of its significance is the greatest possible service to the patient, whereas failure to do so is inviting a crisis which will certainly place a life in jeopardy at no very distant date. The phase may last for several weeks and is probably well described by the husband of one of my patient's when he said she was "pale and tired and without interest." This prodromal prostration culminates in the development of "a sore throat" with dysphagia and a febrile reaction, and appears to be perpetuated in the form of an increasing mental hebetude and apathetic indifference to the complaint and surroundings; it may indeed be difficult for the observer to appreciate from the behaviour of the patient that, in many cases, dissolution is impending. The febrile reaction is moderate—100–102° F.—in most cases, but high temperatures have been recorded. The complexion is sallow and of "putty-like" hue, but true jaundice is exceptional. Apart from the occurrence in some cases of superficial ulceration no abnormality in the form of petechiæ or anomalous pigmentation has been noted in the skin. Tenderness on pressure over the long bones is often present and, as in two of the cases reported below, tenderness over the sternum may be a conspicuous feature. The local lesion is a necrotic ulceration usually of the buccal or pharyngeal mucous membrane, but also sometimes of the œsophagus, rectum or anal region; the skin anywhere may also be the site of ulceration but this is less frequent. The slough and the surrounding tissues have just those characteristics which would be expected in the absence of leucocyte activity; the former is tough, dry and of mat appearance, the latter showing an unexpectedly minimal degree of redness or inflammatory reaction and the whole giving the impression of chronicity or indolence. Involvement of the cervical glands is rarely striking and, indeed, would not be expected to be severe in the absence of leucocytes. Conversely, it might be mentioned here that a leucopenia occurring with extensive cellulitis in the neck is probably indicative of a "secondary agranulocytosis" resulting from exhaustion of the marrow. The blood picture is one of profound leucopenia—principally of the granular cells which may entirely disappear—with a milder degree of anæmia and no particular reduction in the number of the blood platelets. The illness runs a course of from three to ten days and has a high mortality. If recovery occurs relapses are frequent and appear to be as dangerous to life as the original attack.

## TREATMENT

The general treatment is carried out on the usual lines of a febrile illness, but particular care must be taken to avoid the administration of amidopyrine as an analgesic constituent. As regards specific treatment liver injections, blood transfusions, and X-ray applications to the long bones have been tried with disappointing results. Laudatory reports have been published regarding the efficacy of pentnucleotide, but a survey of the cases treated by this method in this country leaves an uneasy feeling that the stated reduction of mortality to 25 per cent. does not rest on any very secure foundation. The best that can be said is that at present the results of pentnucleotide treatment are superior to the other methods mentioned and give the patient about an even chance of recovery. For this reason it should be given as early as possible and, in view of the gravity of the disease, in doses of 20 c.cm. twice daily for three or four days. It would seem that by this time a clinical response will be apparent in favourable cases. Local treatment may consist of swabbing the mouth and throat or other superficial lesion with hydrogen peroxide, but there seems no call for undue disturbance of an already apathetic patient for the purpose of dealing with a local lesion which is only a minor manifestation of much more serious pathology. The importance of preventive treatment is almost too obvious to warrant mention. Clearly all forms of amidopyrine should be eschewed for all time.

## CASE REPORTS

CASE 1. Married woman, aged 49 years, was seen on November 13, 1934, complaining of a "sore throat" of five days' duration. The pain was intense and she had great difficulty in swallowing anything. Before the onset of the illness she had not felt well for some time and had been undergoing "slimming treatment" which included the ingestion of some "tablets" for three or four months (the composition of these tablets, which had been given by another medical man, could not be ascertained). The previous history included an operation for gall-stones in 1929 but otherwise contained nothing of material importance.

On examination the patient was found to be a stout woman of sallow complexion who displayed sufficient strength at 6 p.m. to sit up in bed and vigorously attempt to gargle. That she had great difficulty in swallowing was demonstrated by her constant activity in wiping away a profuse secretion of saliva from her mouth. Temperature 102° F., pulse 128. There was slight enlargement of the cervical glands. As regards the throat the most striking abnormality was the presence of a tough-looking yellow slough running downwards on the anterior pillar of the fauces on each side. There was no gross inflammatory reaction or œdema and the dysphagia appeared to be disproportionate to the local findings. A blood-count was done immediately and the total white count found to be 600 c.mm., of which only 2 per cent. were polymorphs. A diagnosis of agranulocytosis was made and a telephone message to London ensured the receipt of pentnucleotide the following morning. She received 10 c.cm. that day and 5 c.cm. the next morning, but by this time she was almost moribund and died an hour or two later. A second blood-count done three hours before death showed a total white count of 1,200—polymorphs nil.

Case 2. Married woman, aged 52 years, was seen on April 6, 1936. The history in this case covers a period of three months during which she felt "good for nothing," easily tired and indefinitely "out of sorts." This became so severe that at the beginning of March she took to bed for no other reason than that she felt "too languid." She called in her medical attendant (she was then resident in Manchester) who found she had a temperature of 104° F., and said that she had influenza. The temperature subsided the following day but she did not feel any better and still complained of "feeling tired." She continued to remain in bed and, no improvement occurring in her malaise after a further ten days, her husband purchased a bottle of a yeast preparation. Two or three days later, on March 22, she awoke in the morning with a prickling sensation in her throat, and this was followed until she came under my observation by a progressive weakness and general weariness. The previous history included frequent attacks of quinsy though none in the last three years; one ovary was removed by operation at the age of 26.

The patient was a stout woman of uniformly sallow, "putty-like" complexion. She showed striking apathy and indifference to her surroundings and evinced little interest in her complaint, looked extremely tired and rather resented interrogation which was met by obvious mental effort. Around the anus and extending outwards over the left buttock was a large triangular ulcer with a dry slough but without notable surrounding inflammatory reaction. No other abnormality was noted in the skin and the involvement of the cervical glands was minimal in degree. Tenderness was elicited on firm pressure over the long bones and, to a very marked degree, over the sternum. The temperature was 102° F. The mouth was edentulous and the typical dry, yellow slough was present on the left tonsil, anterior pillar of the fauces and left half of the soft palate. The abdomen was slightly distended but no enlargement of liver or spleen could be demonstrated. A slight systolic cardiac bruit was present but otherwise there was no abnormality in the heart or lungs. The optic discs were unduly pale and the knee-jerks could be elicited only with reinforcement; in other respects the nervous system presented no deviation from the normal. The urine contained a trace of albumin but no sugar. A blood-count was done immediately and it was found that the leucocytes numbered 1,900 per c.mm., the differential being polymorphs 4 per cent., lymphocytes 86 per cent., monocytes 10 per cent. Pentnucleotide, which was available, was given at once and was repeated twice daily in doses of 20 c.cm. during the next four days. The result, as reflected in the blood-count, is shown as follows:—

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| April 4. | a.m. | leucocyte | count | 2,050 | polymorphs | - | 4 per cent. |
| | | | | | lymphocytes | - | 4 „ |
| | | | | | monocytes | - | 4 „ |
| | p.m. | „ | „ | 1,800 | | | |
| April 8. | a.m. | „ | „ | 1,800 | polymorphs | - | 2 „ |
| | | | | | lymphocytes | - | 84 „ |
| | | | | | monocytes | - | 14 „ |
| | p.m. | „ | „ | 1,800 | | | |
| April 9. | a.m. | „ | „ | 1,600 | polymorphs | - | nil. |
| | | | | | lymphocytes | - | 86 per cent. |
| | | | | | monocytes | - | 14 „ |

| | | | | | | |
|---|---|---|---|---|---|---|
| April 10. | a.m. | leucocyte count | 1,400 | polymorphs | - | nil. |
| | | | | lymphocytes | - | 82 per cent. |
| | | | | monocytes | - | 4 „ |
| | | | | Türck cells | - | 14 „ |
| April 11. | a.m. | „ „ | 1,200 | polymorphs | - | nil. |
| | | | | lymphocytes | - | 82 per cent. |
| | | | | monocytes | - | 6 „ |
| | | | | Türck cells | - | 6 „ |

The patient died on the morning of April 11.

Case 3. Married woman, aged 75 years, seen on September 25, 1936; five days earlier a "sore throat" which gradually became worse with increasing difficulty in swallowing. She neither felt nor appeared particularly ill, and medical advice had not been thought necessary. Although no account of prodromal malaise was obtainable, it may be assumed that she had not felt completely well from the fact that she had been taking a yeast preparation containing amidopyrine for a considerable period. She had been operated upon many years ago for an abdominal tumour (nature undetermined). She was considerably distressed by the difficulty in swallowing and articulation but not impressed with the gravity of her condition and, in fact, was in her ordinary clothes, having got up and dressed. This fact and the obvious severity of the illness precluded exhaustive examination, but it was noted that the sternum was extremely tender on pressure. The pharynx and soft palate were extensively covered by a tough and thick slough which was somewhat moister than in the two cases reported above and there was more generalized œdema. A blood-count done immediately showed 800 leucocytes—polymorphs nil; 20 c.cm. of pentnucleotide was given but the patient died the same day.

*Comment.*—These three patients were women past middle life. In two cases the ingestion of amidopyrine is clearly established. The period of prodomal lassitude is admitted in two cases and is impressive in case 2. Pentnucleotide failed completely on the one occasion when it might be considered to have had a fair trial. A sense of euphoria or unusual well-being, completely at variance with the gravity of the disease, is noted to persist to within a very short time of death.

My thanks are due to Dr. F. B. Smith, pathologist, Preston Royal Infirmary, and to Mrs. M. J. Martin, B.Sc., for performing a corroborative differential count; also to Drs. J. and J. Longworth for asking me to see these cases in consultation. For making an immediate diagnosis of the last two cases, after contact with the first, they also deserve congratulation.

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# DIET IN HEALTH AND DISEASE

## II—SICK ROOM MENUS AND RECIPES

By R. H. WANSBROUGH, S.R.N.

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It is essential in all cases of prolonged sickness and convalescence that the diet should meet the requirements of the body, and supply all the necessary food constituents in such a form as is attractive to the patient, and at the same time suitable to his condition. It is necessary first of all to consider the normal diet and food requirements, and then to see how these can be supplied to the patient in a suitable form.

The normal diet is one which supplies the following substances in adequate quantities:—

Proteins for growth and maintenance of body tissues
Fats
Carbohydrate } in suitable proportions
} to furnish the calories required.
Mineral Salts, the most important being calcium, phosphorus and iron.
Vitamins.—A, $B_1$, $B_2$, C, D.
Water.

### THE EFFECT OF DISEASE UPON REQUIREMENTS

*Calorie requirements.*—In all cases of acute illness the patient will probably be at rest in bed, so that the energy requirement for activity is automatically reduced. It is important to bear in mind that in certain conditions in which activity is reduced to a minimum, e.g. fractures of the lower limbs or other crippling conditions in which there is no constitutional disturbance, or in convalesence from rheumatism, the appetite of the patient will probably remain normal. He will be inclined to eat as much as usual, or even foods of a higher caloric value (special delicacies prepared by kind friends and relatives) so that the caloric value of the diet will be greater than the requirement of the patient. The patient will then gain a considerable amount of weight which will add unnecessary strain to the limbs or organs, when normal activity is gradually resumed.

Of much greater importance to the caloric requirement of the patient than the effect of activity is the effect of fever on basal metabolism. It has been shown that for every increase in body temperature of 1° Fahrenheit the basal metabolism is increased by 7 per cent., so that in spite of the fact that the patient is in bed, at rest, the caloric requirement may be as high as 3,000 to 4,000 calories per day.

*Protein, fat, and carbohydrate requirements.*—It is important that the protein requirement of the patient is satisfied, and that by an adequate proportion of first-class protein, as there is no decrease in protein metabolism with lowered activity. There is, however, a definite increase in protein metabolism in most cases of severe infections such as typhoid fever. The loss of protein can be greatly reduced by giving a diet with a high caloric value, without much increase in the protein content; this increase in calories will be accounted for by fat and carbohydrate. It is these two classes of foodstuffs—fats and carbohydrates—which are largely responsible for determining the caloric value of the diet, and it is usually these that are increased, or decreased according to the energy requirement of the patient. The actual use of each in the diet will depend largely upon the individual patient, upon his likes and dislikes as well as upon the state of his digestion. The fat content of the diet can be increased, without increasing the bulk of the diet, by using cream in the preparation of dishes, such as creamed soups, or in any dish in which milk is used a small quantity of the milk can be replaced by an equal quantity of cream. Cream can also be used in the preparation of puddings and ice cream. Butter can be added to vegetables, or olive oil used in salad dressings. The fat cannot, as a rule, be greatly increased when there is a disturbance of the digestion, or in cases in which there is marked nausea, or when the carbohydrate content of the diet is very low, as ketosis may result.

The carbohydrate is most easily increased in the form of sugars, glucose being given in fruit drinks, or it can be used in the preparation of puddings; it has the advantage over cane sugar in that it is not so sweet to taste, so that more can be added at one time. It is usually found that patients who are acutely ill, with dry mouths and furred tongues, do not like sweet foods, but this can often be overcome, as far as fluids are concerned, by the addition of lemon juice.

In cases of acute illness, of short duration, little harm will result if the patient is unable to take an adequate diet for a few days, but in all cases of prolonged sickness, such as typhoid fever, pneumonia, tuberculosis and other infections, it is of utmost importance to maintain the patient's strength by giving an adequate diet throughout the course of the illness. This is not an easy task, as the patient's appetite is usually not at all good, and digestion may be impaired. A great increase in the fat or carbohydrate content of the diet, may result in abdominal distension or diarrhœa, but in either case it has been found that if the diet is changed, and the fat increased instead of the carbohydrate or *vice versa*, the disturbance will be relieved.

*Mineral salt content of the diet. Calcium.*—Invalid diets usually contain at least one pint of milk. The calcium derived from the milk will probably be supplemented by calcium from other sources such as eggs, fruits and vegetables so that the daily requirement of 0·7 gm. will be supplied; this is usually accepted as the requirement for an adult.

*Iron.*—If the diet contains a high proportion of milk in relation to the other foods, there is likely to be a deficiency of this mineral salt in the diet. When, however, the diet contains eggs, fruits and vegetables in a good proportion there is not so much risk that this salt will be lacking, and it is chiefly in those cases in which there is a loss of blood from any cause that it is necessary to supplement the iron provided in the diet.

*Vitamins* are essential for the maintenance of health, and it is even more important that during illness they are provided in adequate quantities.

*Vitamin A*, will be provided in the diet during all stages of sickness by orange juice, butter, eggs, milk and later by other fruits and vegetables.

*Vitamin* $B_1$ *and* $B_2$.—These are vitamins of which there is likely to be a shortage in the invalid diet, and it is important that they are provided in sufficient quantities. If there is a good supply of vitamin $B_1$ in the diet throughout the course of a long illness, there is more likelihood that the appetite of the patient will be maintained, and in some cases restored. It will be of real benefit to the patient if the intestinal tract is kept in a good state of "tone," as he will be more likely to be able to take and digest a good diet. Vitamins $B_1$ and $B_2$ can be added to the diet in some concentrated form such as marmite; this can be introduced in a number of ways, such as soup, spread on toast, or in sandwiches, used in the making of gravy, or added to savoury dishes.

*Vitamin D.*—If the patient is receiving open-air treatment, or artificial sunlight he will probably be laying up a fairly good store of this vitamin. From the diet he should be receiving a fair supply of eggs, butter, cream and milk, all of which are good sources of vitamin D, and only in a few cases will it be necessary to supplement by the use of concentrated forms of the vitamin such as cod-liver oil, halibut oil. It is well to bear in mind that if cod-liver oil, either in the pure form, or as an emulsion, is added to the diet, the caloric value will be considerably increased, and if it is used in a preparation with malt, the vitamin B content will be increased; by using halibut oil there will be practically no increase in the caloric value, but in all cases there will be an increase in the vitamin A content of the diet.

*Fluids.*—The importance of fluids in all conditions, and especially during a febrile state, has long been recognized, but it is not always easy to persuade the patient to take as much fluid as is desirable. Every effort has to be made to persuade the unwilling patient to take fluids. Before a drink is offered to the patient, he should have received all the necessary nursing attention, and be in a comfortable position. It is also important that hot fluids are served really hot, but yet not so hot that the patient cannot drink them, and cold fluids must be really cold, or iced, not served tepid. Children can often be persuaded to take fluids by serving the drinks in coloured glasses, or offering them straws through which to suck them, or even by using a little colouring to milk or water. It is as important that drinks, as well as other food, should always be served to the patient in small quantities.

### GENERAL RULES FOR DRAWING UP MENUS AND PREPARING MEALS FOR THE SICK

It is important that as much variety as possible is obtained in all sick-room menus; this does not mean only that actual dishes and foods are not given repeatedly, but that there also must be variety as to colour, texture and flavour.

*Colour.*—This is the first thing that the patient will notice at any meal, and therefore it must always be carefully considered, and as much variation as possible introduced; steamed fish, with white sauce, creamed potato, and purĕed parsnips would be an unattractive combination, but if the sauce was changed to parsley sauce, and purĕed carrots given, the dish would be attractive.

*Texture.*—Here again variation must be introduced whenever possible, although in a fluid or soft diet this is almost impossible, but with a light or fancy diet, it would be a poor combination if potato soup was followed by ground rice pudding.

*Flavour.*—This must be varied as much as possible, and a savoury dish can be followed by a bland sweet, or a bland dish followed by a dish with a tart flavour, e.g. grilled tomato and anchovy toast, followed by a milk jelly or custard, but macaroni cheese should be followed by some sweet such as egg and lemon jelly.

*Temperature.*—It is a good plan to vary this as much as possible and in each meal to give both hot and cold foods.

### USES OF CERTAIN DISHES IN THE SICK-ROOM MENU

*Soups* can be used for three main purposes in the diet—

(*a*) To stimulate the gastric secretion, and so stimulate the appetite.

(*b*) As a means of giving fluids.

(*c*) To increase the caloric value of the diet, by giving thick and creamed soups.

*Vegetables*—

(*a*) Supply vitamins and mineral salts.
(*b*) Can be used for flavouring.
(*c*) Increase the caloric value of the diet.
(1) By the actual food value of the vegetables this applies chiefly to root vegetables.
(2) As a means of adding butter or cream to the diet.

*Beverages*—

(*a*) Supply the fluid required by the body.
(*b*) The means by which all the foodstuffs can be given.

*Sweets and desserts* chiefly supply carbohydrate and fat, and a low proportion of protein.

*Fruits* can be used in the diet—

(*a*) For their mineral and vitamin content.
(*b*) For giving additional carbohydrate as sugar; or fat as cream.
(*c*) For flavouring.

## SAMPLE DIETS

### FLUID DIET.

The amount that it is possible to give in a fluid diet depends almost entirely on the condition of the patient, and the state of his digestion.

| | |
|---|---|
| 6 am. | 5 oz. milk.<br>½ oz. cream. Tea if desired. |
| 8 a.m. | 6 oz. milk.<br>1 egg. |
| 9 a.m. | Glucose lemonade, 8 oz. |
| 12 noon | Creamed vegetable soup.<br>5 oz. milk flavoured with coffee, iced. |
| 2 p.m. | 6 oz. milk.<br>½ oz. cream, Benger's. |
| 4 p.m. | 1 oz. cream in 5 oz. ginger ale. |
| 6 p.m. | 6 oz. milk.<br>1 egg. |
| 8 p.m. | 4 oz. orange juice<br>1 oz. glucose } with lemon. |
| 10 p.m. | 6 oz. milk<br>½ oz. cream } flavoured with ovaltine. |
| 12 midnight, or during the night. | 6 oz. milk. |

The calorific value of this diet is approximately 2,000 calories, but it would be possible to increase this—

(*a*) If the patient could take larger feeds, 10 oz. could be given at each feed.

(*b*) If the patient could tolerate a higher fat content, ½ oz. cream could be added to each feed.

(*c*) 2 pints of lemonade
½ lb. glucose
Juice of 3 lemons
} to be taken in small quantities throughout the day, between regular feeds.

The protein value could be increased by the addition of casein or "Casec" to any of the feeds (1 dessert-spoonful=½ oz.=15 gm. protein), although the flavour is often disliked by the patient.

### SOFT DIET

Approximate—Carbohydrate 260 gm., protein 86 gm., fat 160 gm. Total calories 2,800.

| | |
|---|---|
| 6 a.m. | 6 oz. milk.<br>½ oz. cream. Tea if desired. |
| 8 a.m. | Groats or fine oatmeal made with milk, sugar. Cream 1 oz.<br>Tea with milk. Thin bread and butter. |
| 10 a.m. | Cream 1 oz. with ginger beer. |
| 12 noon | Creamed vegetable soup.<br>Glucose lemonade, 6 oz. |
| 2 p.m. | Milk pudding, semolina, ground rice or cornflour. Fruit purée.<br>2 oz. orange juice.<br>½ oz. glucose. |
| 4 p.m. | 6 oz. milk.<br>1 egg. |
| 6 p.m. | Milk jelly or baked custard.<br>1 oz. milk flavoured with coffee, hot. Thin bread and butter. |
| 8 p.m. | Milk 8 oz.<br>cream, ½ oz. Ovaltine. |
| 10 p.m. | 1 oz. milk.<br>½ oz. cream. Benger's. |
| 12 midnight, or during night. | 8 oz. milk, flavoured as desired. |

### LIGHT DIET

| | |
|---|---|
| 7 a.m. | Tea with milk<br>1 biscuit, or bread and butter. |
| 8.30 a.m. | *Breakfast*—<br>Grape fruit, or other fruit<br>Cereal<br>Egg<br>} A choice of two out of these three courses,<br>Toast, butter, marmalade.<br>Tea or coffee to drink. |

11 a.m. Glucose lemonade, biscuit.

1 p.m. *Dinner*—

Fish, chicken, veal.
Potato, vegetables.
Light pudding.
Juice of two oranges with ½ oz. glucose.
Bread or toast.

4 p.m. *Tea*—

Bread, butter, jam, salad or marmite with bread.
Tea with milk.
Sponge or madeira cake.

7 p.m. Creamed vegetable soup or vegetarian dish.
Milk jelly or baked custard.
Toast.

10 p.m. Ovaltine to drink.

*N.B.*—Brown bread should be given at one meal at least.

### SUGGESTIONS FOR DISHES FOR LIGHT DIET

*Breakfast*—

*Cereals*: Puffed rice, rice crispies, shredded wheat, puffed wheat, cornflakes, porridge, Force served with banana.

*Meat Dishes suitable for Dinner*—

Fish, steamed, fried, boiled, baked. Fish pudding. Fish custard. Fish mayonnaise served with salad. Mock crab served with salad. Chicken, roast, boiled, fricassee, creamed.

*Hot Sweets*—

Cereals, rice (unpolished). Ground rice, semolina, sage, tapioca, vermicelli, made plain or with egg, and served with fruit. Steamed pudding, served with white sauce, jam sauce or treacle. Bread and butter pudding. Queen of puddings.

*Cold Sweets*—

Milk jelly. Egg and milk jelly. Spanish cream. Egg and lemon jelly. Floating island. Foam pudding. Sago or rice custard. Rice, sago or semolina mould, served with jam. Chocolate blancmange. Baked custard. Fruit fool.

*Savoury Dishes*—

Cheese custard. Spaghetti and cheese. Spaghetti and tomato. Baked potato, or stuffed potato. Vegetable stew. Potato souffle. Creamed vegetable soup. Baked egg in tomato. Stuffed tomato.

### RECIPES.

*Lemonade*—

3 lemons.
2 oz. sugar.
1 pt. water.

Peel the lemons thinly, and put in a jug with the sugar, add 1 pint boiling water and stand to cool. Add strained lemon juice.

*Glucose Lemonade*—

Make as for sweetened lemonade, but omit the sugar, in one pint of lemonade dissolve ¼ to ½ lb. glucose.

*Potato soup*—

1 potato.
¼ pt. water.
¼ pt. milk.
½ onion.
2 oz. cream.
1 dessertspoon flour. Seasoning.

Cut the onion and potato in small pieces, put in cold water (¼ pint) and cook till soft; rub through hair sieve. Mix this purée with the milk and heat. Mix flour and cream and to this add the boiling mixture, stir well, and return to pan and cook for at least five minutes. Season.

*Creamed Vegetable Soup*—

Use any vegetable desired instead of potato and onion.

*Baked Fish*—

Take some filleted fish, wash and roll it. Place in a small dish with 1 teaspoonful of butter, cover with paper and bake in moderate oven about 10 minutes.

*Steamed Fish with Sauce*—

4 oz. filleted fish. ¼ oz. butter. 4 oz. milk.

Put the fish in a small dish, season; add butter and milk, cover with paper and cook in moderate oven about ten minutes. Strain off the milk and use this to make a sauce.

*Chicken Fricassee (for using cooked chicken)*—

½ pint chicken stock. 5 oz. chicken, without bone.
1 medium-sized onion, carrot, and small piece of turnip.
3 oz. milk. 1 dessertspoonful of rice or pearl barley.

Cut the root vegetables into ¼ inch cubes, put into the stock with the rice (or barley, previously blanched). Simmer till rice is well cooked about ¾ hour, add chicken cut into small pieces, and milk, and simmer for about 10 minutes. Season.

*Mock Crab*—

4 oz. white fish.
1 large tomato or tomato juice or tinned tomato. Seasoning.

Boil the fish, and then flake. Rub the tomato through a hair sieve, season and mix with the flaked fish. Serve with salad.

*Egg and Milk Jelly*—

½ pint milk. ¼ oz. gelatine. 1 teaspoonful sugar.
1 egg. Flavouring.

Soften the gelatine by soaking in cold water. Heat the milk, and sugar, add to the beaten egg, cook till it thickens slightly, pour on to gelatine, flavour. Pour in two moulds and allow to set.

*Milk Jelly*—

½ pint milk. Flavouring. 1 teaspoonful sugar.
¼ oz. gelatine. Colouring.

Soften the gelatine by soaking in cold water for a few minutes. Warm the milk, and sugar, dissolve the gelatine in it, add flavouring, sugar, colouring. Allow to set in two small moulds.

*Spanish Cream*—

1 egg. Flavouring.
½ pint milk. Colouring.
¼ oz. gelatine. 1 teaspoonful sugar.

Separate the white from the yolk of the egg. Heat the milk and sugar, add to beaten yolk, return to saucepan and cook till it thickens slightly. Pour on to gelatine (which has been softened by soaking in cold water). Flavour and colour as desired. Allow to cool. When cool and almost set, fold in stiffly beaten egg white. Allow to set in two prepared moulds.

*Egg and Lemon Jelly*—

¼ oz. gelatine. ½ pint water.
1 egg. 1 dessertspoonful sugar.
1 lemon.

Heat the water, lemon juice and rind and sugar, and pour over the gelatine in a basin, and stir till dissolved. Beat up the egg, add strained water, lemon and gelatine, stirring well. Sweeten, and set in prepared moulds.

*Floating Island*—

½ pint milk. 1 egg. 1 teaspoonful sugar.
2 sheets gelatine. Flavouring.

Soften the gelatine by soaking in cold water. Separate the white and yolk of the egg. Heat the milk and sugar, add to beaten egg yolk. Cook till it thickens slightly, pour on to gelatine, flavour. Divide evenly into 2 glass dishes, and allow to cool. When cold, beat up white of egg stiffly, add a little sugar and place a little on each custard.

*Foam Pudding*—

Make as Spanish Cream, using only one sheet of gelatine to ½ pint of milk.

*Rice or Sago Cream*—

1 small tablespoon rice or sago. ½ pint milk.
1 egg. 1 teaspoonful sugar. Vanilla flavouring.

Cook the cereal in the milk in a double saucepan for one hour (or in a saucepan about ½ hour) and add sugar and vanilla. Separate the yolk of the egg, beat and to this add the rice and milk, return to pan and cook for one minute, but do not let it boil. Cool. Fold in stiffly beaten egg white.

# NOTES AND QUERIES

*The Editors give below the answers to some of the many queries received during the past month which have been answered by post. It is proposed to publish in subsequent issues a selection of the more interesting questions and answers dealt with during the month, and the Editors will welcome discussions on the points raised. When referring to a question or answer already published, the number of the question should be quoted.*

## VIBRO-MASSAGE

(1) QUESTION.—Is vibro-massage of any use in "tuning up" the muscles of an athlete? Is it of use to an acute fatigued muscle, i.e. to help it recover in half an hour or so? Can it be substituted wholly for hand massage? Does it affect a muscle at all, or does it only act on the skin and subcutaneous tissue? What are the "applicators" suitable for muscle massage?

ANSWER (by an expert in physical medicine)

I do not believe that this treatment has any effect—other than psychological—which cannot be much more efficiently produced by scientific massage. The applicators are made of rubber or ebonite. A vasodilatation is produced, as a result of the vibration, but no actual muscular contraction results as in the case of faradism.

## THE BEST MILK FOR CHILDREN

(2) QUESTION.—What is the best milk to use for children? There is great confusion on the subject and the present grading system does not make it any easier. Is there any serious disadvantage in boiling milk?

ANSWER (by a children's physician)

Safety must be the first consideration and it is generally agreed that for infants all milk should be boiled. The higher grades are only relatively less dangerous. After boiling, as regards safety, there is nothing to choose between them. Hence up to the age of two years (more or less) children should be given ordinary household milk brought to the boil. After that age an efficiently pasteurized variety can be substituted. As far as nutritive value is concerned heating the milk (including boiling) has no deleterious effect. Vitamin C is destroyed but is readily added in the diet as orange juice or tomato juice.

## GREASING THE SCALP IN HAY FEVER

(3) QUESTION.—I have found the applications of oil to the scalp of great value in dealing with hay fever. I wonder whether this "greasing of scalp" has any scientific basis?

ANSWER (by a specialist in allergic diseases)

Symptoms of hay fever from sensitivity to human dander have been reported, and it may be possible that the case quoted is not a true hay fever sensitive to pollen, but rather a case of rhinorrhœa due to sensitivity to human dander, just as other cases occur from the hairs and dander of many animals. In a such case, rubbing oil into the scalp may lessen the production of dry dandruff which initiates the symptoms. On the other hand if the case is one of true hay fever, I do not see how anointing the scalp with oil can have any effect in lessening pollen sensitivity. No doubt our psycho-analytical friends would find some paradox in Biblical stories, but in a true hay fever, whenever the specific pollen reaches the mucus membranes of the eyes, nose, mouth, or respiratory tract, or comes into contact with the least amount of a sensitive person's blood, an immediate reaction occurs, leading to hay fever symptoms.

## THE TREATMENT OF ROUND-WORMS

4) QUESTION.—Can you advise me on the best treatment for round-worms —adult and child? I have had two most intractable cases on my hands for the past six months and tried everything I could think of.

ANSWER

Santonin is the drug of choice for ascariasis. A preliminary purge with a saline cathertic, and a fluid diet for twenty-four hours should precede the administration of the anthelmintic. The santonin is given with calomel, either as a powder, tablet or lozenge. Dosage for a child of two years—1 grain each santonin and calomel—for an adult, 3 grains santonin. On the following morning the patient should be given a full dose of magnesium sulphate, or a Seidlitz powder. Santonin can be given in castor oil, but opinions are divided as to the advisability of its administration in this manner. Yellow vision and reddish coloured urine may be noticed after the santonin, this is harmless; but the possibility of their occurrence should be explained to the patient or parent beforehand. Severe reactions may occur in highly sensitive individuals—vomiting, nervous excitement, headache, convulsions. These effects are exceedingly rare, and measures should be adopted as in the case of poisoning—stomach lavage, and sedatives by rectal route. Oil of chenopodium can also be used, but it is more dangerous, and great care must be taken to estimate the dosage—for a child, 1 drop for each year of age—for an adult 15 minims (10 minims generally sufficient). When given in combination with carbon tetrachloride (1 drachm) it should be followed two hours later by a saline cathartic, or a dose of castor oil. This second measure is not recommended, as fatalities have been known to occur following the use of oil of chenopodium. As ascariasis requires six weeks to mature there is no need to repeat treatment until after the lapse of this period. As preventive measures—strict rules of personal hygiene should be enforced. A pure water supply is an essential prophylactic measure—if this is impossible, all water should be boiled. Raw foods and salads should be thoroughly washed in running water from a reliable source before consumption.

# PRACTICAL NOTES

## THE MODERN TREATMENT OF MALARIA

F. Craig discusses modern developments in the treatment of malaria (*New Orleans Medical and Surgical Journal*, June, 1937, lxxxix, 697). Briefly, the three drugs concerned are quinine, plasmochin and atebrin. Quinine, which is a specific drug, eliminates malarial infection in the majority of cases, but for this elimination to be complete it is necessary for the drug to be taken over a long period and in large doses. The routine treatment recommended by the National Malaria Committee is : for an acute attack 0·65 gm. (10 grains) quinine sulphate by mouth, t.d.s. until all symptoms have disappeared, the nightly dose being continued for a further period of eight weeks. When the attack is not acute the nightly dose suffices. In all infections in which gametocytes are present quinine must be supplemented with plasmochin, in order to render the patient non-infective to mosquitoes. Given in small doses plasmochin does not cause toxic symptoms. Malaria carriers should be treated with a combination of quinine and plasmochin, called chinoplasmin. The dosage is two tablets (each containing 0·005 gm. plasmochin with 0·15 gm. quinine) three to four times a day for eight to ten days. Blood examinations must be carried out to check the results. Atebrin, a quinine derivative, is a rapidly curative drug. It is supplied in tablet form (0·1 gm. per tablet), and the dosage is one tablet t.d.s. for adults and for children according to age. This drug kills the schizonts, but not the gametocytes. To accomplish the latter, it is therefore necessary to combine it with plasmochin. Some authors consider that the combination of these two drugs causes toxic symptoms. In order to avoid this, Craig suggests that the plasmochin should not be administered until two weeks after the cessation of the atebrin treatment. The method of treatment recommended by the Health Section of the League of Nations is, according to Craig, inadequate, as the use of quinine only exposes the patient to the risk of relapses due to the continued existence of plasmodia. In conclusion he considers that for mass treatment quinine is the drug of choice, but when the treatment can be supervised atebrin should be employed.

## ADRENALINE AND THE SPLENOMEGALY OF MALARIA

M. Ascoli and others contribute an article (*Il Policlinico*, April 5, 1937, xlv, 659) relating experiences of forty cases of splenomegaly treated by injection of adrenaline, giving it in doses of 0·05 mgm. daily. He gives photographs showing the reduction in the size of the spleen, and a table showing the presence of the parasites in the blood. From the first injection the patients expressed a sense of well-being, diminution and loss of pain in the spleen. The febrile attacks were lessened and a sense of well-being was most marked, the characterization of the facies was also noticeable, while the spleen became less painful and the body-weight increased. In the same number F. Canova (*loc. cit.* 670) obtained results which confirm Ascoli's observations. After a few injections of adrenaline the splenomegaly underwent a marked diminution. In all the forty-three cases daily injections of adrenaline beginning with 0·01 mgm. were given each day, increasing progressively in from fifteen to twenty days to 0·1 mgm. Out of nineteen cases of chronic malaria disappearance of the splenic tumour was obtained in eight cases, improvement in five, slight in three cases, while in three there was no improvement. Apart from the beneficial effect on the spleen, adrenaline seems an excellent therapeutic measure to associate with quinine for its toxic action, especially in those cases which suffer from hypo-adrenalism.

## ALKALOSIS IN THE TREATMENT OF PEPTIC ULCER

E. H. Berger (*Northwest Medicine*, April, 1937, xxxvi, 125) urges that the possibility of alkalosis in the treatment of peptic ulcer should be kept constantly in mind. The phenomenon usually comes on gradually. Apparently no relation exists between the amount of alkali ingested and the onset of alkalosis. The symptoms of distaste for milk, the patient claiming that it is sour, of headache and of weakness are constant, and they occur early. They are noted in the period of compensated alkalosis prior to the characteristic changes in the blood chemistry that follow. Unless the symptoms are appreciated, the condition will progress and may go on to convulsions and coma. Similar warnings have been uttered in this country by A. M. Cooke (*Quarterly Journal of Medicine*, 1932, xxv, 527), and W. Oakley (*Lancet*, 1935, ii, 187). Oakley stated that the patients have a characteristic headache, which is described as a sensation of weight on the top of the head. When compensation breaks down, the blood alkali reserve is raised from its normal range of between 55 and 75 c.cm. of $CO_2$ per 100 c.cm. of plasma and may even rise as high as 100 c.cm. or more. The blood urea and non-protein nitrogen figures may reach the levels found in true uræmia. There is particular danger of alkalosis developing in patients who have poor renal function. Indeed, neither basic nor acid salts can be administered with impunity in the presence of renal impairment. Not only is alkalosis produced more easily in the presence of pre-existing renal injury, but also that renal injury is increased concurrently with alkalosis, a vicious circle being set up. In any suspected case of alkalosis all alkalis should be stopped, and the alkali reserve and blood urea estimated at once.

## THE TREATMENT OF MASTITIS WITH TESTOSTERONE

The treatment of various types of mastitis by means of injections of testosterone acetate is described by Desmarest and Capitain (*La Presse médicale*, May 26, 1937, xlv, 777). Observations on twenty-seven patients suffering from painful congestion of the breasts, particularly just before the periods, and also those with definite mastitis changes, suggest that this new form of hormone treatment is of definite value. The usual dose employed has been 30 mgm. per month, sometimes increased cautiously up to 90 mgm. per month. The smaller dose is sufficient to prevent the painful congestive changes, and the larger dose is used when there appear to be areas of inflammatory change. The testosterone acetate is injected at a suitable time in the menstrual cycle in order to prevent the development of any mammary congestion or other change. Careful observation is necessary to see that there is no alteration made in the menstrual flow, and the injections should not be given too soon before this is expected. In some of the patients successfully treated, there was definite evidence of an increased output of folliculin in the urine, and it is suggested that the testosterone antagonizes over-activity of the ovarian glands. The encouraging results reported warrant confirmation by other workers.

## TANNIC ACID—SILVER NITRATE TREATMENT OF BURNS

Remarkable claims for the value of the tannic acid—silver nitrate treatment of burns are made by A. G. Bettman (*Journal of the American Medical Association*, May 1, 1937, cviii, 1490). He states that the treatment is superior to any other procedure and implies that it will produce a great reduction in the mortality from burns. The treatment is carried out as follows :

> The patient is given a narcotic, which is repeated as often as may be necessary for comfort. He should be induced to take as much fluid as possible. Locally, grease and oil in any form should not be used because burns so treated heal slowly, become infected, form abundant scar tissue and have a long trying period of hospitalization. If such an application has unfortunately been made, it must be removed with ether, benzene or ethyl acetate before treatment is applied. All blebs are to be opened and all loose skin and other burned tissues are to be removed. A thorough application of fresh 5 per cent. tannic acid solution is made by means of cotton swabs. Following this, 10 per cent. silver nitrate solution is applied in the same manner. The patient is then placed in a tent heated by electric light bulbs and the burned areas are dried and kept dry. In a few days the coagulum begins to loosen and is removed as early as possible. When it comes away, large areas and not infrequently all the burned surfaces will be found to be entirely healed. Occasionally moisture will be hidden beneath the crusts where drying has not been satisfactorily accomplished, and such areas are unhealed. When the coagulum is adherent but loose, it is removed, a scalpel being used if necessary. Unhealed areas are treated by the application of oxyquinoline sulphate scarlet-R gauze, in a single layer over which a light pad of dry gauze is placed, and healing is greatly

speeded up.

The advantage of the combination of tannic acid and silver nitrate over tannic acid alone is that the coagulum is formed at once and only one application is needed. The application of tannic acid produces a grayish white precipitate, which instantly becomes black when in contact with silver nitrate. What was but a moment ago a red, wet, oozing, irritated surface is now covered with a black, smooth, dry, leatherized eschar, soft and flexible, yet firmly attached. In none of many cases treated has argyria or other evidence of silver absorption been noted. The period of hospital confinement has been reduced to one-fourth by this treatment. The remarkable success of the treatment is, of course, partly dependent upon the efficiency of the coagulum as a protection from injury and infection. The reduction in mortality however, arises mainly from the fact that within an hour raw surfaces from which fluid is leaking are sealed up. Some perfectly staggering data as to the extent of the fluid loss from the circulation in severe burns are adduced from experimental work. By comparison with experimental animals, an average man with a burn of one-sixth of the body surface may lose six pints of fluid at the expense of his circulating fluids in twenty-four hours.

## THE USE OF UREA IN THE TREATMENT OF INFECTED WOUNDS.

On the basis of experience derived from treating 139 cases, H. G. Holder and E. A. MacKay (*Journal of the American Medical Association*, April 3, 1937, cviii, 1167) state that the application of gross quantities of urea crystals or of strong to saturated aqueous urea solutions to infected wounds of various types definitely hastens healing and is frequently efficacious when other therapeutic agents are ineffective. Urea application is cheap, does not irritate the surrounding normal tissues and practically obliterates all odour arising from an infected wound, and this without replacing one odour by another as in the case of many deodorants. The mechanism of urea therapy is probably in part by virtue of the bactericidal effect of strong urea solutions (not usually evident with solutions of less than 30 per cent.) but chiefly through the solvent action on proteins, which leads to the removal of the debris, encrustations and dead tissue, which mechanically and by harbouring bacteria are usually the chief deterrents to normal healing. In many of their cases the good results were startling, both in long standing lesions and in more recent conditions. Urea is practically non-toxic and harmless, and so may be used in any reasonable quantity.

# REVIEWS OF BOOKS

*The Control of Tuberculosis in England, Past and Present.* By G. GREGORY KAYNE, M.D., M.R.C.P., D.P.H., with foreword by SIR HUMPHRY ROLLESTON, BT., G.C.V.O., K.C.B. Oxford University Press, London: Humphrey Milford, 1937. Pp. 202. Price 8*s*. 6*d*.

AMONG many memorable advances in the field of public medicine, tuberculosis schemes have come to take a leading place, and to Dr. Kayne a wider circle than the profession owe a debt of gratitude for the detailed and comprehensive survey that he has made. This book should be read by all who are in any way concerned with the medical or legislative problems of tuberculosis, for there is no other single source from which anything like the same historical perspective can be obtained. The book is divided into three sections. In the first are reviewed the treatment and prevention of the disease prior to 1908, the year which for this country marked the entry of the State into this field by making notification compulsory for the first time and by recommendations to sanitary authorities in regard to certain measures for preventing the spread of the disease. In this purely historical section Dr. Kayne constructs a telling picture of the desperate plight from the disease during the seventeenth century onwards. The steps which subsequently led to the development of the existing administration of tuberculosis by the State are described in the second section of the book. In the third section Dr. Kayne deals with tuberculosis service as it exists to-day, preceding this by a short but very clear account of the present ravages of the disease and of those advances which have been made on the purely medical side in regard to pathogenesis, diagnosis, treatment and prevention. His account of the existing schemes could hardly be improved, and this is particularly so in those parts which deal with the inter-relationship of the various members, and with the relation to the general practitioner and to the patients themselves. The present neglected position of the village settlement is fully portrayed; admittedly there are considerable difficulties in extending the principle, but it is sad to think that seventeen years after the Barlow Commission recommended that ten such settlements should be established in this country not one has materialized through the medium of public funds. Whatever its shortcomings in the past the village settlement has in its favour the one outstanding fact that it provides, along with surgery, our only effective means of dealing in a permanent fashion with the problem of the chronic open case of phthisis. One serious omission from this book is any reference to the question of the cost of tuberculosis schemes; nowhere is it possible to gather any ideas on this important matter. The omission here in a book of such wide scope and sympathies is especially unfortunate since it is becoming more and more evident that the most outstanding defects of the present tuberculosis scheme as a whole relate to the wastage and uneconomic use of beds and other facilities, and of personnel. In his final chapter Dr. Kayne discusses the future, but beyond a clear faith in the advantages of State control in all matters relating to health, it is a little disappointing to find no specific suggestions for improving the lot of the tuberculous. Perhaps this is a reticence engendered of caution, but if so it is a pity that it should have sterilized such an effective pen.

*Organization, Strategy and Tactics of the Army Medical Services in War.* By LIEUT.-COL. T. B. NICHOLLS, M.B., CH.B., R.A.M.C. With a Foreword by LIEUT.-GENERAL SIR JAMES A. HARTIGAN, K.C.B., C.M.G., D.S.O. London: Baillière, Tindall and Cox, 1937. Pp. xiv and 372. Price 10*s*. 6*d*.

IT is surprising that so many misconceptions exist about the functions of the Medical Services in war; often regarded as mainly a few doctors and attendants to bind up wounds, "with a bevy of V.A.D.s fluttering in the background," this extensive organization has in war to deal with food, clothing, warmth, accommodation, pay, discipline and transportation of enormous numbers. There is not any book such as this which collects all the scattered regulations and information which officers should have at hand for the proper discharge of their manifold duties. Lieut.-Col. Nicholls who had wide experience as a Medical Officer in the Field during the War, has devoted five years to a book which, the Director-General, Army Medical Services, assures the reader, meets every problem likely to confront the Medical Officer in the Field. It is divided into four parts: General organization and administration, constitution and organization of medical units, medical tactics and strategy, and a selection of exercises and problems to illustrate what has gone before. It is therefore an invaluable source of reference.

*If Air War Comes: A Guide to Air Raid Precautions and Anti-Gas Treatment.* By L. HADEN GUEST, *M.C.*, M.R.C.S., L.R.C.P., London: Eyre & Spottiswoode, 1937. Pp. vii and 88. Illustrations 3. Price 1*s*.

THE author was formerly Medical Instructor at the Air Raid Precautions Department of the Home Office, and writes clearly and in simple language on what every layman should know in the event of air raids. The subject matter is contained in seven chapters dealing with the attack, the protection of the home, the respirator and the poisonous gases, the protection of industry and vital services, the national and local protection services, doctors, first aid and hospitals, and on decontamination of materials. There are also ten short appendices which give more detailed information. Thoroughly practical this useful handbook should be in every household.

*Psychiatry for Practitioners.* By Various Authors. Edited by HENRY A. CHRISTIAN, A.M., M.D. Oxford University Press. London : Humphrey Milford, 1937. 646 Pages. Price 30*s*.

THIS reprint from the Oxford Loose-Leaf Medicine is the work of ten American psychiatrists, and two British—Dr. T. A. Ross, who writes on the psychoneuroses, and Professor D. K. Henderson, who contributes the most considerable article on manic-depressive psychoses. The influence of Adolf Meyer is seen in many places. The simpler Freudian theories are mentioned. Professor Henderson's view that these have not aided therapy as much as had been hoped, but have always stimulated interest, is shared by the other writers. When questions of constitution and temperament come up, some divergence of views is evident. Professor Kahn has dealt with the psychopathic personalities, a welcome addition to psychiatric textbooks. Special mention should be made of the first chapter on "The Recognition and the Management of the Beginning of Mental Disease," by Strecker and Palmer, and "The Psychiatry of Childhood," by Gerald Pearson. Some of the examples of pscyho-pathology in the neuroses in the first are unduly facile, but the emphasis throughout the book that the nervous and mental patient is not just an individual reacting to *one* stress is welcome. The importance of the pre-psychotic personality is constantly pointed out, as is the narrowness of the dividing line between normality and morbidity. More emphasis upon the variations in the normal would have been welcomed. Ego-centric touchiness is often found in the pre-psychotic. It is, however, not a sign that psychosis *will* follow. It is a useful point that operations upon nervous children are fraught with more anxiety and disturbance than is often realized. Broad wisdom of a similar character pervades the whole. There is no mention of psychiatric social workers, who are filling so important a function in obtaining a satisfactory case history. Case notes abound. Much important work by others is summarized, and the whole is eminently readable.

*Principles of Medical Statistics.* By A. BRADFORD HILL, D.SC., PH.D. London: *The Lancet* Limited, 1937. Pp. viii and 171. Price 6*s.*

STATISTICS are notoriously dull and for the average medical reader (or writer) difficult to understand. No better introduction to the subject exists than this volume which is a collection of contributions to the *Lancet.* The author is not only one of the leading experts in the subject but he has obviously a well-balanced mind and he uses a bright style to make the dry bones of his subject alive with interest and common sense. His particular insistence upon the need for planning statistical analysis from the very outset of a piece of medical research is one which many workers will profit by and his discussion of common fallacies contains much that is imperfectly understood even by well-known physicians and surgeons.

*The Riddle of Napoleon.* By RAOUL BRICE. Translated from the French by BASIL CREIGHTON. London: Putnam, 1937. Pp, vii and 345. Illustrations 8. Price 15*s.*

THE great "Man of Destiny" who for a time had "the power to bind kings with chains and nobles with fetters of iron" is a constant cause of curiosity. In this well-translated book the question is raised whether he really believed in the actual existence of his star which only he could see in the heavens. Medically there has been much discussion about his ailments; had he hypopituitarism as Leonard Guthrie argued, epilepsy which Arnold Chaplin strongly contested, undulant fever as Keith believed, Stokes-Adams' disease, or gastric carcinoma, as seems most probable; or, as the French maintained more than a century ago and Surgeon Lieut.-General

Brice of the French Army now elaborates, fatal dysenteric hepatitis caused by confinement in unhealthy St. Helena? Under the heading "The Fable of Cancer" the author explains the post-mortem findings by the order of the Governor of the island, Sir Hudson Lowe, that any hepatic lesion was not to be recorded!

### NEW EDITIONS

*Skin Diseases in General Practice*, by DR. H. HALDIN-DAVIS, in its third edition (Oxford University Press, 17*s.* 6*d.*), has appeared six years after the preceding version and the advances which have occurred in the realm of dermatology during that period are well reflected in the revisions and additions now presented. In particular the modern treatment of varicose ulcers and the radium treatment of malignant disease of the skin are well described. This excellently-produced and well-illustrated monograph will enhance its reputation in its latest form.

FOR the second edition of *Muir's Bacteriological Atlas* (E. & S. Livingstone, 15*s.*), Dr. C. E. van Rooyen has rewritten the text and enlarged the whole volume. The eighty-three coloured plates by the late Richard Muir are beautifully reproduced and the text is thoroughly up-to-date and a worthy commentary on the illustrations. Students of bacteriology should find this of very great value and the publishers must be congratulated not only upon the general excellence of the whole production but also upon its modest price.

*The Treatment of Diabetes Mellitus*, by ELLIOTT P. JOSLIN, M.D., is written with the co-operation of H. F. ROOT, M.D., PRISCILLA WHITE, M.D., and A. MARBLE, M.D. (Henry Kimpton, 32*s.*). In the sixth edition this standard work has undergone extensive revision, special attention being focussed on protamine insulin in which and other future insulin compounds, the author and his collaborators see the beginning for the diabetic patient "of a new and better epoch—the Hagedorn era." The amount of information contained in this volume far exceeds the scope of its title, and it might well be described as the Dictionary, rather than merely the Treatment of Diabetes Mellitus.

*Handbook of Diets*, by MISS ROSE M. SIMMONDS, S.R.N., in its second edition (Heinemann, 7*s.* 6*d.*) is a valuable guide to the modern developments of nutrition and their practical application. Lists of suitable meals in health and disease are plentifully supplied and, as Lord Dawson states in a foreword, the selections are made with due regard to the " art of good feeding."

IN the four years which have elapsed since *Clinical Contraception* by GLADYS M. COX, M.B., B.S., first appeared there has been a rapid growth in the scientific aspect of the subject. In the second edition (Heinemann, 7*s.* 6*d.*) Dr. Cox makes the recent advances in knowledge available in practical form and she maintains that a combination of a mechanical and a chemical contraceptive, selected for the individual patient, gives the greatest possible security against conception.

# NOTES AND PREPARATIONS

## NEW PREPARATIONS

Antostab.—This is a new preparation made from pregnant mares' serum. It is an anterior pituitary hormone, and is active only when the ovaries or testes are present. Antostab is administered by intramuscular injection, and is especially indicated in cases of primary and secondary amenorrhœa, and metrorrhagia. A booklet, entitled "A New Gonadotropic Follicle-Stimulating Hormone," giving full details of the preparation and its use, can be obtained from the manufacturers, Boots Pure Drug Co., Ltd., Wholesale & Export Department, Station Street, Nottingham.

Percalcin.—A concentrated solution of calcium in organic combination, containing two-and-a-half times as much calcium as a 10 per cent. solution of calcium gluconate, is prepared by Messrs. Evans Sons Lescher & Webb Ltd., Evans Biological Institute, Runcorn, Cheshire, for intravenous and intramuscular injection. (Intravenous dosage 4–25 c.cm.; intramuscular 2–4 c.cm. daily.) Supplied in boxes of six 5 c.cm. rubber-capped bottles, costing 7s. 6d. per box, and 30 c.cm. rubber-capped bottles, costing 5s. per box, its use is especially indicated in conditions of nervous debility, infantile tetany, chilblains and urticaria. The treatment is stated to be painless and non-irritant.

## BAD NAUHEIM

Bad Nauheim, situated at the foot of the Taunus Mountains, has long been recognized as the premier Spa for cardiac diseases. Lavishly provided by Nature with curative springs, these have been adapted and developed for drinking and bathing purposes. There are natural warm saline springs, rich in carbonic acid which have a particularly beneficient effect on cardiac conditions. Rheumatic affections and diseases of the nerves and spine also yield readily to treatment in this ideal spot—and owing to the equable temperature and absence of fog and wind, diseases of the respiratory organs can also be successfully treated. The town is extraordinarily beautiful, and is surrounded by many places of interest, which renders it an ideal spot for a holiday, quite apart from its curative properties. Full information regarding sanatoria, treatments, and accommodation, can be obtained from the German Railways Information Bureau, 19, Regent Street, London, W.1.

## THE MEDICAL DIRECTORY, 1938

Messrs. J. A. Churchill Ltd., 104, Gloucester Place, London, W.1, write: "To maintain the accuracy of our annual volume we rely upon the return of our schedule, which has been posted to each member of the medical profession. Should the schedule have been lost or mislaid, we will gladly forward a duplicate upon request. The full names of the doctor should be sent for identification."

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LIBR

# THE PSYCHOLOGY OF MOTORING

By MILLAIS CULPIN, M.D., F.R.C.S.

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EXCEPT for the results of the invention of gunpowder and those applications of mathematics that permitted trans-oceanic navigation, our means of transport, communication, and war improved but little between ancient times and the beginning of the nineteenth century; but, within the lifetime of many of us, scientific advances have placed at our command mechanical possibilities that not only call for a new adjustment of mental and physical reactions, but provide stimuli to instinctive tendencies which, for want of opportunity, had hitherto failed to find easy expression. Of these new possibilities the motor car most concerns our daily life, and a consideration of the psychological aspect of motoring appeals to one who has held driving licences in three continents.

Starting with a broad view, one sees a generation which has grown up side by side with a developing mechanical capacity for speed, and has unquestioningly accepted that speed as part of its normal environment. The absence of emotional reaction in the face of a casualty list of killed and injured as great as that of a nineteenth-century war suggests that, in spite of occasional reasoned protests and the efforts of responsible authorities to lessen the totals, we have become reconciled to conditions at the thought of which the members of an earlier generation would have shuddered. Anthropologists talk of cultural mosaics—patterns of belief and usage into which are moulded the minds of the individual members of the herd, so that what appears as ill-advised, foolish, or repugnant to the outsider is accepted without question by its members, the desirability of speed, even at the cost of a few thousand lives per annum, has now become part of our cultural mosaic.

### SPEED

So much must be accepted. Speed in the transit of goods is, however, of less psychological interest than in the transit of the person; the shortening of the transit period of a ton of coal has little emotional value, but the thrill of personal speed, especially if the speed makes direct impression upon the senses, gives to many people a satisfaction which is perhaps difficult to account for on *a priori* biological grounds. In William McDougall's enumeration of instincts and instinctive tendencies there is no description of a conative tendency the satisfaction of which should provide the keen enjoyment that speed gives to so many people. Such a tendency certainly exists, though before the mechanical age the speed of a galloping horse marked the limit of its satisfaction. Psychologists have not hitherto recognized it as a specific quality, perhaps because it does not appear to fulfil any specific biological need, but its recognition seems imperative so that it may be brought under social and educational control like the more biologically useful instinctive tendencies of sex, acquisitiveness, or aggression. Hitherto we have allowed its development in the individual to be freely stimulated.

The adaptability of the human organism has on the whole proved itself under the new demands, but failure is fruitful of consequences and it is failure of the human organism rather than of the mechanical product that most often causes disaster. We hear of road sense, and as to that we can only say that it depends upon intelligence and experience; and of road manners, which must depend more upon the temperamental make-up of the driver, for aggressiveness and readiness to resentment can make dangerous the most expert. The learner is likely to offend more by timidity and over-caution than rashness, and most of us have seen a car bearing the informative L and holding up a train of would-be speedier cars behind it.

### THE DANGEROUS DRIVER

It is in the recognition and elimination of the dangerous driver that we have most to learn. The work of Farmer and Chambers for the Industrial Health Board has shown the existence of accident-prone people in industry and that they can be detected by standardized tests, but it has not been shown that the tests would apply to would-be drivers. Indeed, the proof would involve testing them experimentally and then watching for results, and such an investigation is not practicable. Something could be expected from the psychological examination of drivers who have met with accidents, and this should certainly be carried out. To examine witnesses and decide in open inquiry that so-and-so was to blame may satisfy our sense of justice, but it leads no further towards an understanding of why so-and-so failed. One road transport company in the United States made a psychological examination of all its employees who met with accidents, and in many cases an extrinsic cause was discovered. In my own experience I have, in the course of a psychological examination, occasionally elicited the cause of an earlier accident, a cause that was not apparent to an ordinary inquirer at the period of its occurrence.

Of possible psycho-pathological causes of road accidents I would put first the elated phase of a cyclothymia or—what is much the same—a persistent hypomanic state. The combination of euphoria with super-abundant energy may not be recognized for what it is, and the true cause of repeated offences may remain undiscovered. I have, however, known a wise practitioner to recognize the condition and put his veto upon driving while it lasted.

Symptoms more specific may be recognized by the sufferer. One is an obsessional impulse to hurry—not necessarily confined to locomotion—which I have had described to me by a man in a humble walk of life who assured me that he would break his neck some day whilst riding a bicycle because of the compulsion, which gave him no pleasure at all. The desire for the thrill of speed, however, is not technically an obsession; an obsession is, by definition, recognized by its owner as irrational and undesirable.

An impulse to charge oncoming vehicles has, within my experience, stopped one gentleman from driving; another distressing symptom was a phobia induced by the impossibility of seeing ahead when following behind another car, which led a driver to pull out of line, even when he had no intention of passing, so that he could see the road in front of him; a fear of the near-side kerb made another use up more width of the road than he really needed. All these were recognized as pathological by the sufferers and were less dangerous for that reason.

Consideration of the attention necessary whilst driving involves some general principles. It is healthy and normal in accustomed work for attention to be divided; the typist who must concentrate upon her work without letting her thoughts go to anything else is either inefficient or a worrier, and the driver who is all the time aware of concentration upon his task is in similar condition. He should be reacting to the demands of the moment without conscious effort, and only by so doing can he drive for any length of time without exhaustion. There exists theoretically the danger that action may become so automatic that sleep momentarily overtakes the driver, and some accidents have been thus explained. On the other hand, if work demands constant alertness, and interest is absent, then it may be necessary to force attention upon it all the time. It is recognized that this forced attention is mentally exhausting and such conditions may be present in some forms of driving, but it is only by actual investigation that their existence and effect can be established in any particular case. Many motorists have discovered the limits of speed and distance beyond which one or other of these ill effects may become manifest.

### THE PEDESTRIAN

Something must be said of pedestrians and their psychology. Being human, they are capable of resentment and contrariness, and it is reasonably feared that a recent decision concerning the responsibility of the motorist at marked crossings may lead to motivated—I will not say deliberate—attempts to inconvenience him. There is a rhyme about the man who was killed in demonstrating his right of way, and for such a one there can be little to hope. But there is a dangerous phraseology, employed often in official reports, by which we are told that in such-and-such a percentage of cases " the pedestrian was to blame." There is a difference between a fault and a misfortune, and it is the misfortune of the pedestrian that a moment of indecision or inadvertence may endanger his life or limbs. School children are especially cared for at danger spots and are not expected to exercise sufficient decision and alertness to look after themselves. How far are we right in demanding that the human adult should exercise sufficient attention, decision, and alertness to preserve his bodily integrity in modern traffic or be " to blame " if he does not? That we are expecting too much is shown by the distribution of accidents, which falls heavily on those of advancing age as well as upon those at the other end of the scale of years. We may readily agree that this incidence depends upon inevitable infirmities of age and childhood, infirmities which cannot be denied and to which the attribution of blame is inappropriate; but can we assume that these infirmities do not exist in the intermediate age-group and that the natural faculties of an adult in the prime of life are sufficient to safeguard him from mishap when he crosses a stretch of studded roadway to which traffic may be approaching not only from in front and from either side of him but also from behind?

## SUMMARY

By the developments of the motor car new mechanical powers are put at the command of the ordinary man and new demands are made upon the human organism. The result is a perturbing list of fatalities and injuries, and it is plain that advance has been more rapid than the human adjustments to the new demands. To some extent it may be possible both to exclude would-be drivers who are unfit to be trusted with the new powers and, by rules and regulations, to control some of the common mistakes of other users of our thoroughfares, but we must not demand more from ourselves than even the wonderful adaptability of the human organism is able to supply.

# VISION AND THE MOTORIST

By N. BISHOP HARMAN, M.B., LL.D., F.R.C.S.

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THE best personal equipment for safe and comfortable motor driving is a pair of good eyes. Driving entails no inconsiderable strain upon the physical endowment of the driver. The better this endowment, the less will be the strain. Defect will increase the strain, and in some conditions make driving so hazardous as to require its prohibition.

## VISUAL ACUITY

Safe progress for the motor driver demands that the sight of the driver shall have a threefold quality: Visual acuity; field of vision; and binocular vision. These factors in vision are the same as those needed for the ordinary movements of walking in the home or out-of-doors. But in driving the speed of movement and the size of the vehicle render some of these factors of relatively greater importance. Everyone must have sufficient acuity to see where he is going, and what may be before him. The State has intervened in the case of the driver and decreed that he must have a certain acuity—ability to read the number plate of a motor car at a distance of twenty-five yards with one or both eyes and with or without glasses. This visual acuity is equal to 6/15 on the Snellen's standard distance test card. For the purpose of seeing the bends and crossings of the road, and for the recognition of objects in the roadway, that is to see pedestrians and animals well enough to be able to judge of their probable movements, this twenty-five-yard standard is probably enough. But the fact that this criterion alone is recognized seems to belittle other factors of vision, which for walking and particularly for driving are of far greater importance.

## FIELD OF VISION

In all movements a good and sufficient field of vision is of prime necessity. Without that the sharpest visual acuity is useless. Patients with acuity equal to 6/9 may, by reason of the extreme limitations of their fields, be so blind that they have to be led about. On the other hand patients who cannot read a letter of any size, or recognize the face of a friend, on account of the destruction of the macular region of each eye, are able to move about freely because their peripheral fields are good. The field of vision is limited by the setting of the eye in the face. A big nose, beetling brows, a heavy moustache, and deep-set eyes will mean limitation of the field to the middle line, upwards and downwards, but the lateral fields of the two eyes, to the right and to the left, will be scarcely affected at all. These normally extend to about 95° from the fixation point. It is this part of the fields which is in constant use in walking. Experience shows that persons with a 20° loss of this part of the periphery of the field find that in ordinary walking they are liable to bump against other persons or door posts. They do not see objects that are close beside them. Such a limitation as this will be dangerous in a high degree to the driver of a fast moving car.

Further, it is important to recognize that this loss of field is not always obvious to the patient, until it has been demonstrated by an accident. When there is a defect in visual acuity the patient is conscious of the inability to see clearly. He sees, yet he cannot see as clearly as he knows that he should. Or he notices that others see the time by clock towers when he cannot. With the field of vision it is otherwise. There is no sense of anything being missing. Each can demonstrate this for himself. If the eyes are normal and one eye be covered, the vision of the open eye will seem perfectly even everywhere. Yet there is a considerable area that is blind, Mariotte's blind spot, the nerve head, which at the distance of one foot from the eye covers the area of more than a penny piece. Yet if anyone looks at a sheet of white paper there is no suggestion that anything is missing. Even when by scotometry the blind spot is demonstrated there is no sense of loss, no obvious void, no black spot, there is just an absence that is unperceived and therefore unknown. It is possible to stand on Westminster

Bridge and look with one eye in a certain direction and the whole of the huge upper storey of the Victoria clock-tower will vanish from sight. It will just not be there. There will not be any sense of its absence except for the knowledge that it ought to be there.

This peculiarity of the loss or limitation of the field of vision makes such defects especially dangerous, much more dangerous than defects of visual acuity. Fortunately defects of the fields of vision are much less common than defects of acuity. It is fortunate both because of their danger to life and because there is no means of correcting or extending a contracted field. Glasses may correct a defect of acuity, but they have no effect upon the field, except to limit it by reason of the distortion produced by lenses of high power.

The statutory requirement of vision in this country refers only to visual acuity, and ignores the field of vision. The standard is therefore a poor one for the safety of the driver and of other road users. Other states in Europe and America have passed laws requiring certificates of medical fitness which are much more definitive.

> For example, in Germany only those individuals are suitable to drive motor cars in whom the visual acuity is over 6/12 in one eye, with or without correction, and reaches a minimum of 6/36 in the other eye; provided also that the field of vision is normal, and the examination has eliminated the question of any illness recognized as causing weakness of sight. Persons whose visual acuity in one eye is less than 6/36 or completely lacking, may be passed if that condition is at least of two years' standing and the other eye has an acuity of at least 6/9 without correction. Such cases require the certificate of an oculist. Persons suffering from diplopia, aphakia, or hemeralopia are unfit to drive motor vehicles.

In this standard there is an attempt to make a scientific scale of visual requirements, and if it can be shown that defect of vision is accountable for road accidents, then it would be a much better standard than that in this country.

## BINOCULAR VISION

Binocular vision is without doubt the highest development of the visual faculty. In man the animal face and body position has been changed to secure this development. The eyes are in front, they work together on parallel axes. There is normally constant binocular or stereoscopic vision, and with that the ability to determine the size and position of distant objects. This judgment is cerebral, but it is to a large extent effected by an unconscious, but trained, perception of the nerve impulses required by the extra-ocular muscles in moving the eyes. With the growth of this power of the eyes there has been a corresponding development of the brain in the area of the visual centres. In man these occupy an enormous area as compared with the hunted animals, and even when compared with the areas of the hunting animals. Man is therefore easily first as the " mighty hunter before the Lord." It is this great development that makes man the cunning workman that he is. Binocular vision is something that he who does not possess it cannot understand and therefore cannot realize what is missed.

The need for binocular vision for the motor driver is less important than a good field of vision. I am sure that it makes for a good driver. By it he can instantly judge the size and distance of objects and his relation to them. It is true that this can be found to some extent by the unconscious movement of the head, and the appreciation of the parallax. But the evidence gained thereby is not always reliable. Medical officers of the R.A.F. hold that defects of binocular vision are in the main responsible for bad landings, which account for a large proportion of flying accidents. In somewhat the same fashion car drivers who frequently get into minor scrapes owe their lack of judgment to defective binocular vision. There are recorded examples of one-eyed men who have done well. Hinchliffe was one-eyed and a great airman. Wiley Post who flew round the world in nine days was described as a one-eyed Red Indian. An even more remarkable feat was performed by an Italian car driver in a race in Ireland. A stone hit his goggles, and splinters cut his eyeball. After a rest he pluckily resumed driving in spite of the bandage over one eye. To drive a car at a hundred miles an hour in such a state was no mean feat. I have also known one-eyed patients drive in London traffic in safety.

Notwithstanding those exceptions I do not like the one-eyed driver and should not employ one. I have tried driving one-eyed, and did not like the experience. Much of the difficulty drivers find in reversing is due to the fact that during that driving they are one-eyed. With the British rule of the road a man blind of the right eye and with a Wellingtonian nose is not safe! A fair measure of the safety of the one-eyed can be gained by his ability to play tennis. Fast ball games need swift judgment of positions; those with good binocular vision excel, those with bad binocular vision or none are usually failures. Golf is different, the one-eyed man can play the game almost as well as the man with perfect binocular vision.

Defects of ocular muscle balance have other effects upon the capabilities of the driver. They cause much eye-strain and headache in ordinary life. The risks of these consequences are intensified by the speed of the car, and the need for constant watchfulness. Such eye defects will increase the liability to fatigue, and the fatigue will in its turn increase any disability arising out of the defect. Consequently defects of muscle balance likely to cause diplopia in states of fatigue will require caution. In the lower degrees a sufferer from this disability will not be likely to be unsafe, but he should be cautioned against long drives or driving in poor health. In higher degrees with frequent symptoms of diplopia there will be added risks. It is certain that constant diplopia should be a bar to driving unless this can be done with one eye partly obscured with the Chavasse glass.

## "POOR VISIBILITY"

Difficulties arise from variations in lighting. With some drivers these difficulties are increased by reason of the state of their eyes.

*Night driving.*—Modern lighting equipment and satisfactory dipping gear have greatly improved the conditions of driving. The light sense is, however, of much importance. It is common to find that myopes dislike night driving, for the very form of their lenses reduces the light that enters the eye. It is comparatively easy to determine whether a person with a doubtful light sense is safe or not. If with a perimeter the peripheral field be mapped out in good daylight, and then again after the adjustment of the window blinds so as to reduce the illumination to one tenth of the full light, the excessive reduction of the field in those with defective light-sense will be manifest. Such persons will be safe drivers in daylight but dangerous at night.

*Colour blindness.*—This should be no trouble to the driver except in the recognition of coloured signal lights. A mistake in reading one of the signals may bring the colour-blind driver into conflict with the police, and possibly into collision with other drivers or pedestrians. Efforts have been made, without avail, to persuade the authorities to make the signals recognizable by shape as well as by colour, e.g. a horizontal bar of red light for stop; a round yellow light for caution; and a vertical bar of green light for a clear road.

*Glare.*—Glare from the sky or road may be very trying. Many cars are fitted with a small opaque vizor on a universal joint, which can be swung out to cut off sky glare. In the absence of such a fitment a cap with a good peak is invaluable. Road glare is more difficult to deal with. A piece of cardboard held vertically in the hand over the steering-wheel makes a convenient rampart over which to peep.

*Fog* is the bugbear of movement. There is no cure for it. Coloured lights do not really help. Coloured light is part of a normal white light, and is therefore of less power. Fog is due to the suspension of myriads of minute droplets of water in the air. The light strikes against these droplets and is dispersed, just as it is by the facets of a brilliant. In a day fog lamps are useless, except as warnings to others. At night a lamp that will project a flat beam of light close to the ground (where the fog is usually thinnest) will give much help. It will illuminate the kerbstone or verge, and not be reflected back into the eyes of the driver. There are some valuable lamps of this type on the market. Strange stories are told of the ability to see through a fog.

I had such a case recently. A director of a large transport company brought to me one of his drivers. He said the man was a wonderful driver in the fog, and wanted to know what special quality of sight the man had to be able to do this. I put the man through all the tests. His eyes were as perfect as they could be, but there was no evidence of any special power. When the director was out of the room I asked the man how he had gained this reputation. He said " Well, I just drive."

### REACTION TIME

This sketch of sight in relation to driving may convey but a poor view of the complexity of it, and it does not touch upon the interrelation of sight and muscular co-ordination of the foot, hand, and eye of the driver. Nor does it hint at the overriding power of nerve control suggested in the term " reaction time." That power of response which makes two persons who show an apparent equality in equipment yet a difference in capacity. Many accidents arise from a defective reaction time. Perhaps as many are due to visual or cerebral anæsthesia, because the mind behind the eyes is far away from the road; " seeing, they shall see, and shall not perceive." This visual anæsthesia has caused many deaths, and there is no cure for it. Again, reactions vary from time to time, so that a good test one day may be valueless on the next. Ill-health, unwise indulgence, and fatigue (such as is caused by too long driving) produce wide variations in reaction time. One driver is made jumpy and so handles his car injudiciously, and it skids into a crash; another becomes too slow in the uptake, and he runs into a collision. The very perfection of the modern car is a temptation to disregard fatigue, but the risk is real and must be recognized.

So far the remarks made have had particular reference to the private driver. There are also the special needs of the transport driver. Public utility and transport companies and taxicab proprietors must demand a proper medical examination of the eyes of their employees. They are responsible for the safety of their drivers. A strict examination and standard is justified for these drivers, for they have to drive in all weathers, both day and night, and in any variation of fitness short of ill-health. It should be recognized that these medical examinations are in the best interests of the men themselves, as well as for the safety of others on the road.

# FUME POISONING AND MOTORING

By SIR WILLIAM WILLCOX, K.C.I.E., C.B., C.M.G., M.D., F.R.C.P.

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THE dangers of motoring to-day are indeed many. There are the risks of accident due to careless and inefficient driving of other motorists whereby collision or accident may be brought about and also the risks of mechanical defects leading to sudden failure of the steering gear, and of a burst tyre which may cause an unavoidable accident. There is another group of accidents which may be called "autogenous" whereby the toxic effect of fatigue products, poisoning by fumes, or possibly the action of alcohol, or drugs taken for medicinal purposes may so affect the brain that the judgment and quick decision of the driver, so necessary for the perfect control of a car, may be impaired and an accident result. Elsewhere in this issue of *The Practitioner* the question of alcohol is being dealt with (*see* p. 232), and the purpose of this article is to call attention to the danger of "fume poisoning" in association with motoring, not only in respect of the toxic effect of fumes on the driver of a car, but also the possible danger to health arising from exposure to fumes in the garage or elsewhere.

The discussion, the important subject of "Fume Poisoning," will include :—

(1) *The products of combustion of the petrol, benzol or other propellant,* the explosion of which in vapour form when mixed with air gives the necessary driving power.

First in importance is *carbon monoxide* (CO). This very poisonous gas is present in the exhaust fumes of a car in action in amount from 6 to 10 per cent. Most of the dangers of "fume poisoning" arise from exposure to this gas and its action is so insidious that the onset of symptoms may pass unnoticed until unconsciousness supervenes.

*Carbon dioxide* ($CO_2$) exists in high percentage in exhaust fumes. It is not of itself dangerous because its dilution with air lowers the percentage below the danger limit. Carbon dioxide when inhaled acts as a stimulant to the respiratory centre and causes rapid and deep breathing and, when mixed with the very poisonous carbon monoxide, increases the rate of absorption of this gas by its effect in stimulating the respiration.

"Exhaust fumes" include a certain amount of unconsumed petrol or benzol and their decomposition products which have a toxic effect.

(2) *The vapour of petrol and benzol*, to which those in a car or garage may be exposed, are definitely toxic.

(3) *The products of the imperfect combustion of the heavy oil* used for the lubrication of the car include fumes which are toxic and irritant; amongst these may be mentioned "acrolein" which is irritant to the lungs and air passages and may cause lachrymation.

(4) "*Ethyl petrol*" and the possible risks from its use.

The above will be considered in further detail.

### CARBON MONOXIDE POISONING

Carbon monoxide even when greatly diluted with air and respired is absorbed by the blood and may give rise to toxic symptoms. The affinity of CO for hæmoglobin has been shown by Haldane and others to be 300 times that of oxygen, and no CO is oxidized in the body. Thus 1 part of CO in 1,500 in air would lead to the blood becoming half saturated with CO, i.e. to 50 per cent. of saturation of the hæmoglobin if blood were exposed to this mixture in vitro. The alveolar air only contains 14 per cent. oxygen so that when respired a mixture of CO with air in the proportion of 1 in 2,140, i.e. 0·047 per cent. could lead to 50 per cent. saturation with hæmoglobin.

The effect of air containing carbon monoxide on a person exposed depends on the duration of exposure and whether the person is at rest, i.e. breathing lightly or undergoing exertion and breathing deeply. Experiment carried out in America (*Public Health Bulletin*, 1929) on men exposed for several hours daily to a mixture of exhaust fumes from a motor-car engine showed that 2 parts of CO per 10,000 of air caused, if the subjects were at rest or undergoing mild exertion, slight symptoms in two hours, and in three to four hours frontal headache and a blood saturation of 20 per cent. A blood saturation of 25 per cent. might be reached in five to six hours if mild exertion was undertaken. If exertion was at all severe the periods of exposure for these degrees of saturation would be less.

When a person is exposed to air contaminated with CO no symptoms except slight fatigue occur if the blood saturation is below 20 per cent. Beyond this point the symptoms become more severe as the saturation increases. There are progressive fatigue, headache, muscular weakness, loss of memory, mental disturbance, palpitation of the heart, throbbing of the head, nausea, vomiting, vertigo and ataxic gait, drowsiness and a great desire to sleep.

A percentage of saturation of the blood of 80 per cent. is the fatal limit, and deep coma will have supervened. Death will be imminent unless rapid treatment is instituted.

A most interesting address on carbon monoxide poisoning given by the late Prof. J. S. Haldane before the Medico-Legal Society is well worth a very careful study. Attention was directed to the close similarity of the early symptoms of CO poisoning to those of alcoholic intoxication. The following is a quotation from that address:—

> "The mental and moral deterioration in CO poisoning seems to take rather different forms in different persons just as with the effects of alcohol. Some persons simply become more and more torpid, others become foolishly hilarious, while others become extremely ill-mannered, quarrelsome and almost dangerous. It is a curious fact, however, that at whatever stage of incompetence one may be, one remains quite confident in one's own judgment just as a drunken man is. It is very easy to mistake carbon monoxide poisoning and its after effects for drunkenness and its after effects. The symptoms are all the same, as well as the most common after-effects including nausea, vomiting and headache.

In such cases the only certain method of diagnosis would be the analysis of the blood for the determination of the percentage of saturation of CO which can be readily carried out by means of the Hartridge Reversion Spectroscope. When the breath smells of alcohol or alcoholic poisoning is suspected, an analysis of the blood for the percentage of alcohol present would at once determine whether the symptoms were due to that cause.

A classical case occurred a few years ago in which the late Professor Haldane gave evidence. A motor car containing the driver and two gamekeepers stuck in water which had overflowed a road. The exhaust pipe was under water and the car was closed, the windows being shut owing to the cold weather. The engine was left running, and the driver left the car to seek help. He was arrested by the police for drunkenness on account of his ataxic gait, vomiting, and peculiar behaviour. When the police returned to the car its two occupants were found dead. A post-mortem examination disclosed all the signs of CO poisoning and the blood was found to be highly saturated with CO. As a result of this evidence the driver was acquitted.

In a recent case in which I gave evidence a medical man driving a closed car was found to be suffering from loss of memory, headache, and vertigo. He was charged with being under the influence of alcohol. Examination of the car by a motor engineering expert showed a gross defect in the junction of the exhaust pipe in the front of the car, which led to the entrance of exhaust fumes into the interior of the closed car. In this case a detailed examination of the symptoms showed them to be due to CO poisoning and not to alcohol and an acquittal resulted.

It cannot be too strongly urged that great care should be taken that in closed cars there is no escape of exhaust fumes into the interior of the car due to faulty joint connections of the exhaust pipe. Even slight contamination of the air inside a car may lead to drowsiness and mental dulness which may well be the cause of an accident in driving. The danger to life of allowing the engine to run in a closed garage is very great and this should never be permitted.

The Departmental Committee on Ethyl Petrol in their published Report (1930) drew attention to the contamination of the air in crowded thoroughfares in London by motor vehicles. Analytical investigations by the experimental staff appointed to assist the Committee showed that a maximum concentration of 1 part of CO in 10,000 occurred in the air of streets during traffic congestion. Since 2 parts in 10,000 give rise to definite symptoms of poisoning it may well be that under certain conditions of air stagnation and fog the concentration of CO may reach a limit of danger to those on point duty in congested thoroughfares.

The public in consequence of the numerous fatalities from poisoning have come to realize the danger of exposure to coal gas, the toxic properties of which are due entirely to the carbon monoxide present in it (4 to 10 per cent.). Exhaust fumes from a motor car contain a slightly higher percentage of CO than coal gas. The danger to health and life of exposure to exhaust fumes cannot therefore be too strongly realized and every effort must be made to guard against this serious risk.

## CARBON DIOXIDE

Carbon dioxide ($CO_2$) is present in high percentage in exhaust fumes. When diluted with air the mixture of $CO_2$ in air is not in itself dangerous to life though it may produce headache and depression. A percentage of $CO_2$ in air of over 3 per cent. will cause some dyspnœa and increased rapidity and depth of respiratory movements. In this way the $CO_2$ present in exhaust fumes may when mixed with air increase the lung ventilation and cause the dangerous carbon monoxide which always accompanies it to be more rapidly absorbed. In other words the presence of $CO_2$ in exhaust fumes increases the risk of poisoning from carbon monoxide.

## PETROL VAPOUR

This occurs in exhaust fumes because some of it has escaped combustion. It is also present in the air of garages owing to the evaporation of spilt petrol or that present in the engine of a car not running. The inhalation of air containing petrol vapour may give rise to headache, giddiness, nausea, vomiting, and general malaise and ill health. High degrees of concentration, which are not likely to be met with in the cases under consideration, might give rise to asphyxia, stupor, and even unconsciousness.

*Benzol vapour.*—This may occur under the same conditions as petrol vapour if benzene is used as a propellant. The immediate symptoms of inhalation of benzene vapour are similar to those produced by the vapour of petrol. In addition it must be remembered that benzol is a blood poison and has a destructive action on the white corpuscles. Continued exposure to benzol vapour leads to chronic ill health and may even cause such damage to the bone marrow and blood-producing organs that agranulocytosis and anæmia may result.

### DANGERS FROM OIL

The products of the imperfect combustion of the heavy lubricating oils used in cars contain many irritating substances one of which is acrolein. These products are irritating to the air passages and conjunctivæ and may cause cough, lachrymation, and also headache, giddiness, nausea, and general malaise. Their presence in the air of a car should be a danger signal that there is a leakage from the exhaust pipe connection and no doubt these irritating vapours would be accompanied by carbon monoxide in a dangerous percentage. The unpleasantness caused to the occupants of other cars by the pollution of the external air by the smoky irritating fumes escaping from a badly lubricated car needs no comment. Fortunately the police not infrequently caution the driver whose car is polluting the external air by the irritating fumes arising from the imperfect combustion of the lubricating oil owing to mechnical defects in the lubrication of his car.

### ETHYL PETROL

Ethyl petrol is petrol which is mixed with lead tetra-ethyl, a very poisonous liquid, in the proportion of 1 of the latter to about 1,300 of petrol. The mixture when used as a propellant is said to lead to a more controlled combustion and explosion in the engine of the car and to prevent the phenomenon known as "knocking" of the engine. Lead tetra-ethyl is a poisonous organic compound and has a selective action on the brain and central nervous system when absorbed. It may give rise to acute mental symptoms such as mania and encephalitis. Several fatal cases of poisoning have occurred in those exposed to contact with this poisonous substance in its manufacture. When ethyl petrol was introduced into England about 1927 much public apprehension was aroused by alarming reports in the press. In consequence of this a Special Departmental Committee was appointed by the Government in April, 1928. The whole question of the possibility of danger from the use of ethyl petrol was fully investigated by this Committee and numerous experts and other witnesses gave evidence. An interim report was made in July, 1928, and a final report was published in February, 1930.

It should be mentioned that the mixing of the poisonous lead tetra-ethyl with petrol is carried out at central stations under special precautions and it is not permitted at garages where the ethyl petrol and other motor fuels are sold. The fullest investigations showed that there was no risk from the use of ethyl petrol as a motor fuel, and no case of poisoning from ethyl petrol was reported to the Committee though very full inquiries were made. As a matter of precaution it was recommended that ethyl petrol should be sold in containers specially labelled, and that the liquid should be made distinctive by the addition of a dye. A warning on the can states that the liquid should be used for no other purpose than that of a motor fuel. Ethyl petrol is of course associated with the same risks from carbon monoxide poisoning as those above described in association with the use of ordinary petrol and benzol. The addition of the small percentage of lead tetra-ethyl was not shown to add to these risks.

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# ALCOHOL AND THE MOTORIST

By ALEXANDER BALDIE, M.B., D.P.M.

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TO secure the safety and the convenience of the public the law now provides penalties against dangerous driving. To this end the Highway Code prescribes *rules* for all users of the Road; *regulations* are applicable to the mechanism of the motor vehicle itself, and others to the health and efficiency of the individual driver. Motorists are thus required to drive with a degree of " proper control," which, in the absence of any legal definition, depends on : (*a*) the absence of physical disability, an implied condition of the granting of a driving licence; (*b*) competence to drive, ascertained by means of the driving test; (*c*) abstinence from alcohol, or drugs, to the extent to which technical efficiency may be impaired.

It is the last condition with which this article is concerned. During the year 1936, 666 persons were proceeded against in the area of the police of the Metropolis on account of being medically certified to be under the influence of drink or drugs to such an extent as to be incapable of proper control of a motor vehicle. These figures do not include a considerable number of persons, who, though found to be under the influence of drink, were not medically certified as incapable of proper control. In 1933 there were in Great Britain 1,595 convictions for driving under the influence of drink; in 1934, 2,016 motorists were medically certified to be incapably under the influence of drink.

## SUBINTOXICANT EFFECTS OF ALCOHOL

The British Medical Association Special Committee on the Relation of Alcohol to Road Accidents expressed the opinion that three ounces of whisky (producing concentration up to 0·043 per cent.) " must frequently affect the driving capacity of the driver who takes alcoholic liquor " since, even in this moderate amount the drug affects " the power of making movements dependent on rapid and accurate co-ordination;

. . . the ability of the eyes to follow clearly an object brought nearer and nearer to them; the speed and accuracy of hand movements; the hand and eye co-operation involved in type writing; and the co-ordination of leg movements in walking and climbing."

Figures based on an analysis of 119 accidents have shown that of these 74 of the persons examined exhibited a blood and/or urine content of more than 0·02 per cent. of alcohol. Other evidence confirms the view that at or above this concentration the drug has the effect of disorganizing neuromuscular, sensory, and mental faculties in variable degrees.

Above percentage concentrations of 0·15 the intoxicating effects of the drug become more definite, though variable and *individual.* The effects on performance of given amounts differ in kind rather than in degree; that is to say one individual may be alert and vivacious, but unable to walk or speak with normal precision; another may walk, talk, and write with fair success whilst exhibiting frequent lapses into drowsiness or inattention. To appreciate the clinical picture of such a condition it is necessary to discard the old conception of drunkenness. So far as the term had, or has, any medical or scientific significance the practical meaning of the word " drunk " is one of (*a*) disorderliness of speech and of social demeanour and behaviour; or (*b*) inability to stand or walk. But incapacity for proper control of a motor vehicle depends on functional deviations which may fall short of, or differ from, these effects. It is a truism that many physiological states may affect the somatic balance on which mental efficiency largely depends. These include states of cold, fatigue, neuralgias and psychalgias, alimentary tensions connected with hunger, repletion and defæcation, as well as chemical agents of which alcohol is the present example.

### EFFECTS OF INTOXICATION BY ALCOHOL

The intoxicating effects of alcohol may be summarized as follows :—

*First,* there is a diminution of visual efficiency due to constant though variable effects on the power of accommodation and on the sensitiveness and range of the light reflex; and the power of convergence is affected.

*Second*, there are disturbances of tactile and other sensations.

*Third*, there is a raised blood-pressure, and a rapid and forcible pulse.

*Fourth*, there are physical disturbances of gait, posture and speech, and of motor efficiency generally.

*Fifth*, there are disturbances of the alimentary tract, including, usually, a dry tongue, a fullness in the epigastrium, and a sense of repletion.

*Sixth*, there is an increased metabolism; it stimulates appetite, and also diaphoresis and diuresis; in subintoxicant quantity it is an easily absorbed and applied source of energy; its effects on well-being are correspondingly satisfying, in greater concentrations sympathicotonic effects are predominant with restlessness and confusion; with a subsequent reaction to listlessness and drowsiness.

*Seventh*, technical efficiency is affected as follows : There is a diminution of the power of judgment, and initiative, and of accurate response. When the individual is " normally " a hesitating individual, apprehensive or "nervous" the drug may, temporarily, by its relaxing effect create a transient feeling of confidence and " steadiness," and a diminished distractibility. This fact is the basis of the somewhat fallacious claim by some persons (usually nervous or highly-strung drivers) that they " never drive better than after a glass of whisky." Against this claim is to be set the fact that any such improvement must be transient and that the total effect of the drug in all cases is to induce behaviour reactions which are premature, unpremeditated or exaggerated.

*Eighth*, there is often a loss of the sense of time, and of the power to identify places and people.

*Ninth*, apart from these effects there are, often, emotional disturbances which further affect the capacity for judgment.

### EFFECTS ON DRIVING EFFICIENCY

The executive processes concerned in driving a motor car are those concerned with starting, steering, gear-changing, braking, acceleration, clutch manipulation and signalling; and others concerned with attention to the car itself, such as operation of wiper, ventilation or lighting. For the proper performance of these executive acts is required a sense of time, speed, direction and distance; and of the relation of fixed and other objects, such as moving vehicles, traffic signals, and obstructions, including pedestrians and stationary vehicles. The physical and mental factors concerned in these are (*a*) Neuromuscular co-ordination; (*b*) visual efficiency; (*c*) emotional equilibrium; i.e. coolness and steadiness in emergency; (*d*) faculties of attention, comparison, discrimination and judgment; and (*e*) alertness and accuracy and quickness of response.

The effects of the drug on driving efficiency may therefore be summarized as follows :—(1) Diminished powers of attention, and judgment; (2) Faulty recognition and definition of moving and stationary objects and signals; (3) Impaired power to estimate speed, position, direction, and relation to other traffic; (4) Inaccuracy and slowness or absence of response to emergency stimuli; (5) Diminished power, and inco-ordination of motor performance; (6) Impaired capacity for steadiness and self-control in emergency.

### REFRESHMENT RULES OF THE ROAD

Experience proves that the use of alcohol as a widely prevalent habit cannot be checked by measures of prohibition or of moral temperance propaganda. Such methods unfortunately fail to reach or control those by whom they are most required. Nevertheless certain general rules may be suggested as the basis of a code of Road Hygiene, the observance of which may be acceptable to many motorists. In this connection two facts are significant :

(1) A large, though unascertained, proportion of road accidents occur as the result of physical disability, illness, fatigue, indulgence in alcohol, and other " distracting " influences.

(2) Perhaps 30 per cent. of persons who are charged with driving whilst " under the influence " may be described as " accidental " cases; that is, they are persons who either do not habitually drink, or who do not usually drink when driving; they find themselves caught up in a

circumstantial network of celebration, indulgence and fatigue. Also, any acute illness, especially a febrile or a painful one, will disturb mental poise and indirectly affect a person's driving efficiency; and any normal physiological state, such as the repletion following a heavy meal, over exertion, eye-strain, want of sleep, or the emotional reactions following fright or anger; even, perhaps the exaltation of a piece of good news, or of a flirtation, may result in a critical though transient distractibility.

The following rules therefore are suggested in relation to the use of alcohol: they may be usefully amplified by any medical motorist:

(1) On any occasion on which the use of alcohol is a contemplated ritual, leave the car at home.

(2) Avoid alcohol for at least two hours before driving; this period is strictly applicable only to the most modest and conventional amounts.

(3) Especially avoid alcohol on long journeys; on the early part of the journey because of the dangerous " third stage " of drowsiness; on the later part of the journey because of the (equally dangerous) combined effects of alcohol and fatigue.

(4) Avoid alcohol on any journey undertaken alone.

(5) Any alcohol consumed should be taken only with meals.

(6) Do not select an alcoholic beverage merely to relieve thirst; a routine practice of sipping cold water at intervals on a journey will often counteract fatigue and, often remove any desire for alcohol.

(7) Avoid all alcohol when fatigued, " out of sorts," or ill.

(8) Avoid the use of alcohol under abnormal or difficult conditions calling specially for the exercise of judgment and technical efficiency.

(9) The wheat should never be mixed with the grape; " cocktails " and spirits are relatively " explosive " in their action; beer is apt to cause drowsiness under conditions of fatigue or monotony.

(10) Never speed the parting guest who has been already well entertained and who has to drive home, with "just another little drink."

Such rules may not be acceptable to immoderate drinkers. They may appear undesirable to some total abstainers and others. To the temperate and responsible motorist to whom the idea of excess is repugnant they may be of some help.

### TYPES OF OFFENDER

This is not the place to discuss the value of legal penalties and of other deterrents to alcoholic excess on the road. Legal penalties graduated "to fit the crime" are still in process of evolution by combined or alternative methods of fine, imprisonment, or suspension of licence.

Medically offenders may be grouped in one of three classes: (1) the "chronic alcoholic" whose efficiency level is never very high and may be variably disordered by moderate quantities of liquor; (2) the reckless or deliberate (and intemperate) joy-rider; and (3) the "accidental" case of a normally respectable and abstemious person who, returning home from an occasional celebration or reunion, is unconsciously overcome, and finds himself the victim of circumstances and of his own indiscretion.

The effectiveness of any deterrent penalty will obviously be greatest in relation to the third class; here suspension of licence may constitute an unnecessary hardship; and even a public disadvantage should it involve loss of employment. Experience of many such cases suggests that the mere shock of arrest is in itself a sufficient deterrent from any repetition of this offence.

In regard to the first and second classes it seems likely that only prolonged or permanent suspension can sufficiently protect either the public or the offender from the consequences of his irresponsibility.

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# COMMON INJURIES AND ACCIDENTS DUE TO MOTORING

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EVERY medical practitioner must be familiar with many of the characteristic injuries which are associated with motoring. In this article some of the facts dealing with the commoner of these injuries will be considered.

The remarkable increase in popularity of the motor car, associated with the fact that the production of so many cheaper models has made it possible for many members of the community to purchase these vehicles whereas twenty years ago the car was a luxury owned by few, has made this problem one of great interest to every citizen.

In addition to the car the motor cycle has steadily increased in popularity, and it will be shown that the rider of the motor cycle is especially liable to share in the injuries commonly associated with motoring.

### FREQUENCY OF FRACTURES

The majority of motoring injuries of any severity result in fractures, and for this reason the article will deal chiefly with a discussion of such fractures. To endeavour to get some idea of the frequency of the different types of motoring fractures it was felt desirable to study the cases dealt with in the fracture departments of two of the hospitals in the London area.

From January 1, 1935 to June 30, 1937 the total number of fracture and head injury cases admitted to the wards of the Poplar Hospital for Accidents (i.e. over a period of two and a half years) amounted to 529 fracture cases and 464 cases of head injury which were not associated with fractures. Of this number of cases it was interesting to note that only forty-five of the fractures and twenty-four of the head injuries had resulted from motoring accidents. This proportion must clearly vary considerably with the district under consideration and it therefore seemed advisable to examine the figures of another

Hospital, i.e. the King George Hospital, Ilford.

During the first five months of this year a total number of 703 fracture cases were dealt with at this hospital in both In-Patient and Out-Patient Departments, and of these, 105 were to be regarded as motoring fractures. This hospital is on a large arterial road where many accidents occur during the course of the year, and this must adequately explain the higher percentage of motoring fractures there as compared with the number of similar fractures dealt with at the Poplar Hospital. The latter hospital is situated in a crowded residential and industrial area where motor vehicles can never proceed at a speed which is possible in an unrestricted area.

It is noteworthy that with the changes that have taken place in the construction of cars during the last twenty to thirty years there has been a steady change in the type of injury seen. The presence of self-starters in every car now has largely diminished the incidence of fractures in the region of the wrist joint resulting from the cranking of a car. Further, the increasing speed of the car; the popularity of the motor cycle; the shape of the door handles; the use of unsplinterable glass for the wind-screen, have all been responsible for new, and in a way more serious, types of motoring injuries.

Before dealing with the individual types of injuries it seems advisable to try to find out the percentage of cases in which a motor-cycle rider was injured in a number of serious accidents. When considering the fracture cases dealt with at the Poplar Hospital for Accidents it was noted that forty-five fracture cases and twenty-four head injury cases were regarded as due to motoring, and of these, no less than twenty-four fractures and thirteen head injuries had occurred to individuals who were riding motor cycles. That means that in this particular series more than 50 per cent. of fracture and head injury cases were motor cycle injuries.

### INJURIES CAUSED BY THE CAR

It is first necessary to consider the injuries that may occur to an individual who is struck by a moving car. Different writers in the United States of America have in recent years made reference to what they call the " bumper fracture," and I am satisfied that this fracture is common in this country. In the early days when bumpers were placed rather higher in position on the front of a car it was quite common to see injured pedestrians who were suffering from a fracture of the top of the tibia into the knee joint. In recent years this fracture has been unusual, and it is now clear that a severe comminuted fracture of the middle of the shafts of the tibia and fibula with vertical

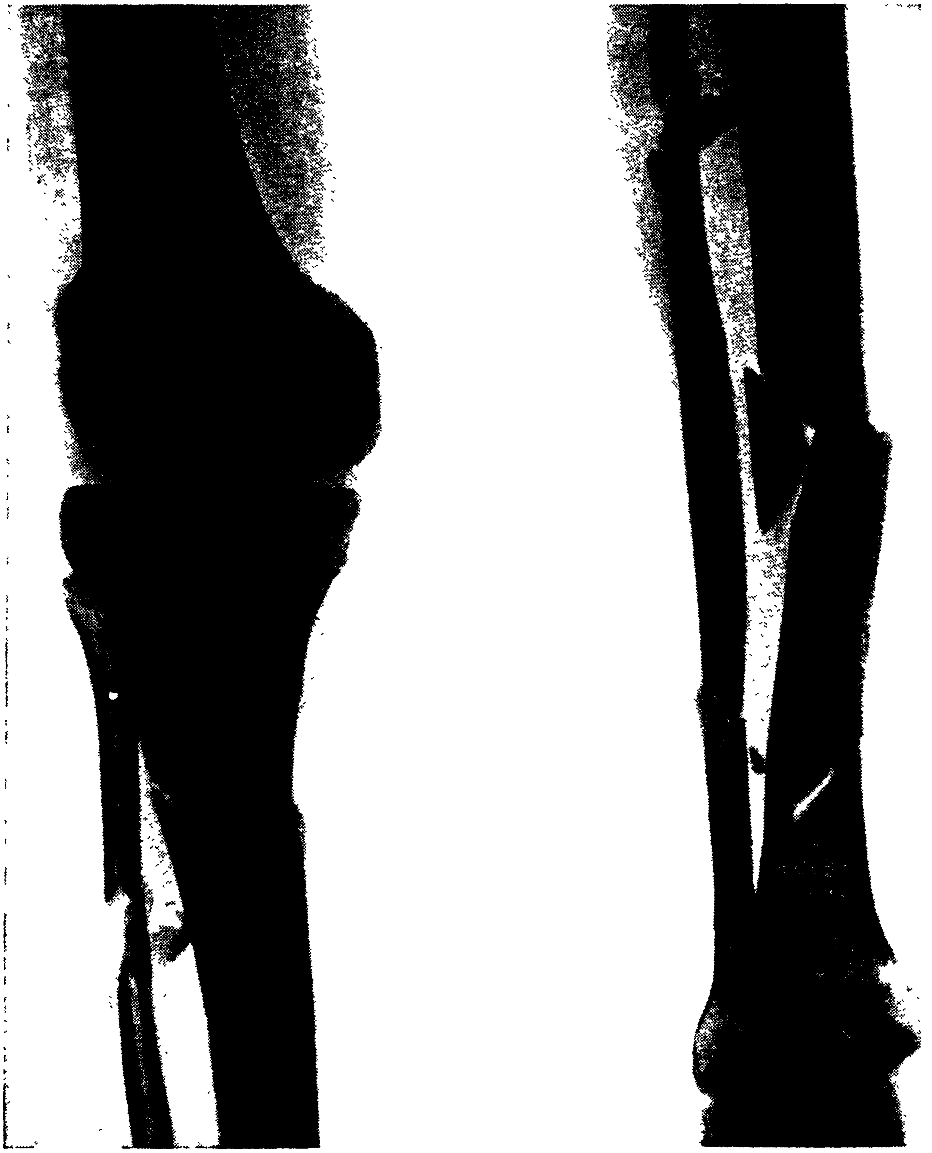

FIG. 1.—Compound comminuted fracture of the shaft of the tibia and fibula. So-called bumper fracture.

cracks running up and down the shaft of the tibia is a much more common type of leg fracture. In addition, the X-ray frequently reveals a completely loose piece of the shaft of the tibia, commonly triangular in shape, lying in front of the middle of the shaft of the bone. These fractures are usually compound, and are classically the site of non-union. The ununited fracture has caused considerable discussion in surgical circles during the last few years, and it would appear that one of the most common sites for non-union is the middle of the shaft of the tibia and fibula, and one of the commonest causes for such a fracture is the motoring injury. In dealing with such a fracture the importance of fixation of the limb as an emergency measure must be remembered. When the patient is transferred from the place of the accident the limb should be temporarily immobilized on a walking stick or similar strip of wood so as to prevent any further serious damage to the surrounding soft tissues occurring.

Every compound fracture must be dealt with as a surgical emergency, and should be regarded as of greater urgency than a perforated gastric ulcer. The patient should be taken immediately to the operating theatre and under an anæsthetic, preferably a spinal or local anæsthetic, the wound excised and carefully sutured. A prophylactic dose of 1,500 units of tetanus antitoxin must always be given and the patient's limb is then put up in some form of apparatus. In a great majority of compound bumper fractures of the tibia and fibula, skeletal traction is desirable. The patient's limb is supported on a Braun's frame and a Kirschner wire is inserted through the body of the os calcis. Direct skeletal traction is in this way applied to the fracture. It has been found that the best results are obtained when dressings are not applied direct to the wound. The limb is left uncovered, fixed on the frame with the skeletal traction apparatus in position; and on the whole, extremely satisfactory results have followed treatment along these lines. It is most important that the fracture should not be over-extended, as it is firmly believed by some authorities that prolonged over-extension in which the fragments are slightly separated from each other, is a most important cause of eventual non-union. At the end of four to six weeks the extension apparatus is removed and the limb fixed in plaster of Paris with a suitable Böhler's iron incorporated in the plaster so as to allow the patient to walk about in the plaster. From time to time the progress of the case is checked by radiological examination, and when it is felt that the fracture is consolidated, the plaster is discarded and if necessary, physical treatment is then started to improve the function of the limb. It is surprising how many

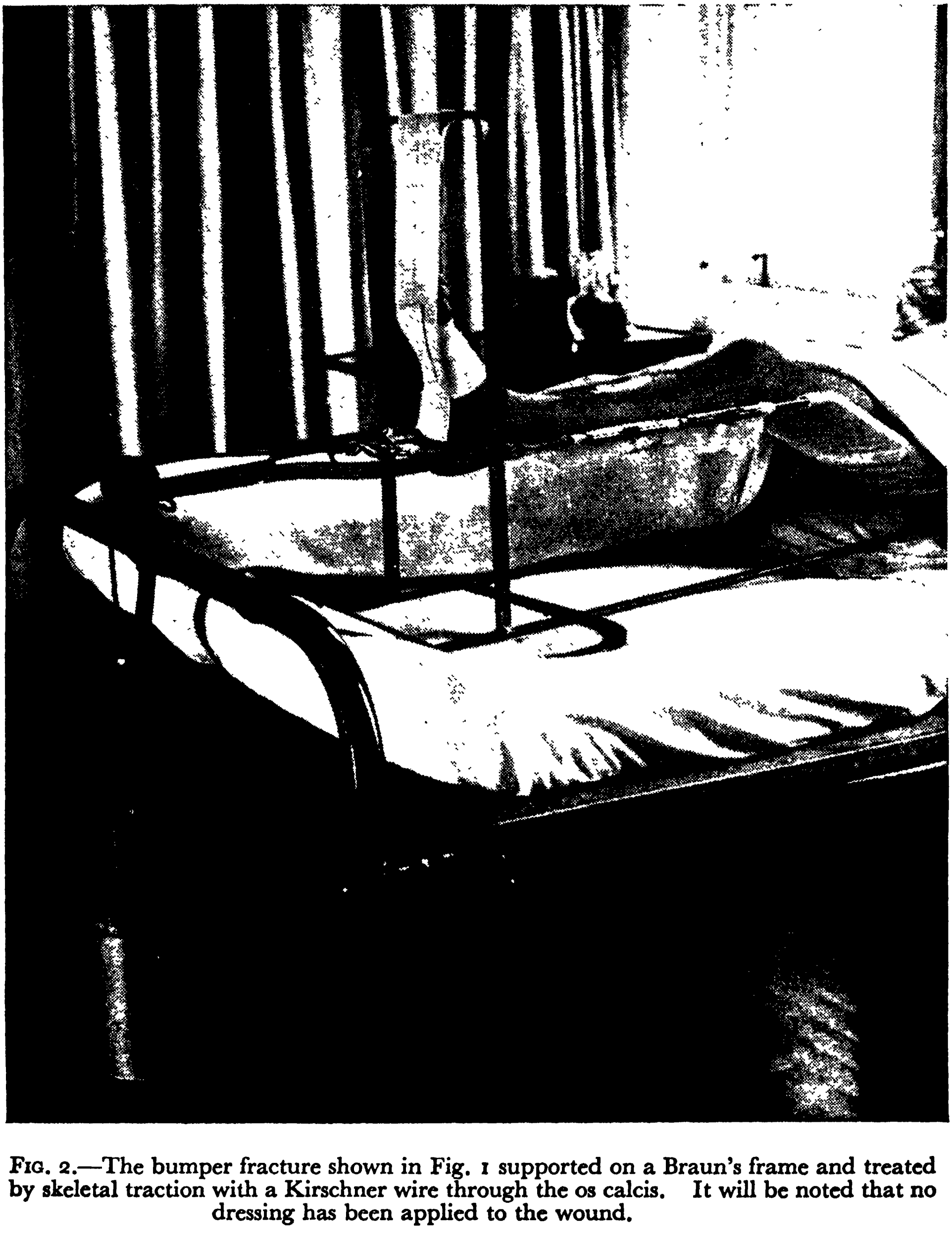

Fig. 2.—The bumper fracture shown in Fig. 1 supported on a Braun's frame and treated by skeletal traction with a Kirschner wire through the os calcis. It will be noted that no dressing has been applied to the wound.

patients do not require physical treatment after the plaster is removed. Simple use of the limb will usually rapidly restore function.

## DOOR-HANDLE INJURY

Another type of important injury which has been recorded in American literature is the " door-handle " injury. Everyone is familiar with the sharply pointed door handle seen on most cars to-day. Some of these door handles have the narrow and sharpest part directed forwards, although in the majority of cases this part of the handle is directed backwards. The fast moving car striking a pedestrian or cyclist with the side of the front part of the car might quite conceivably drive the door handle into some part of the body. McLanahan (1935) and Ogilvie (1935) have recorded a number of such cases in which the skull, chest and elbow and other parts of the body had been penetrated by these pointed door-handles with serious results.

There can be no question that the modern tendency to stream-line cars has brought about these pointed door-handles, and the possibilities of serious injury to pedestrian and cyclist are so definite that some alteration in these handles is desirable. It should surely be possible for the car manufacturers to sink the handle into a depression on the door, leaving the handle flush with the door. This would prevent the possibility of the door-handle injury occurring.

## FRACTURES AT THE WRIST

Injuries when cranking a stationary car still occur, although with very greatly diminished frequency as compared with thirty years ago. At the King George Hospital, Ilford, the back fire of the starting handle has been responsible for such fractures as those of the scaphoid bone of the wrist, the Colles' fracture, the reverse Colles' fracture, fractures of the metacarpal bones, and in addition, a dislocated semilunar bone of the wrist has been seen. A fracture of the first metacarpal bone (Bennett's fracture) is fairly common, and when treated on ordinary lines gives excellent results.

A curious type of fracture of the radius is one following a direct blow from a starting handle in which the patient gets an oblique crack into the wrist joint, the fracture line running upwards and outwards to the outer surface of the expanding styloid process of the radius. These cases are usually not associated with any displacement.

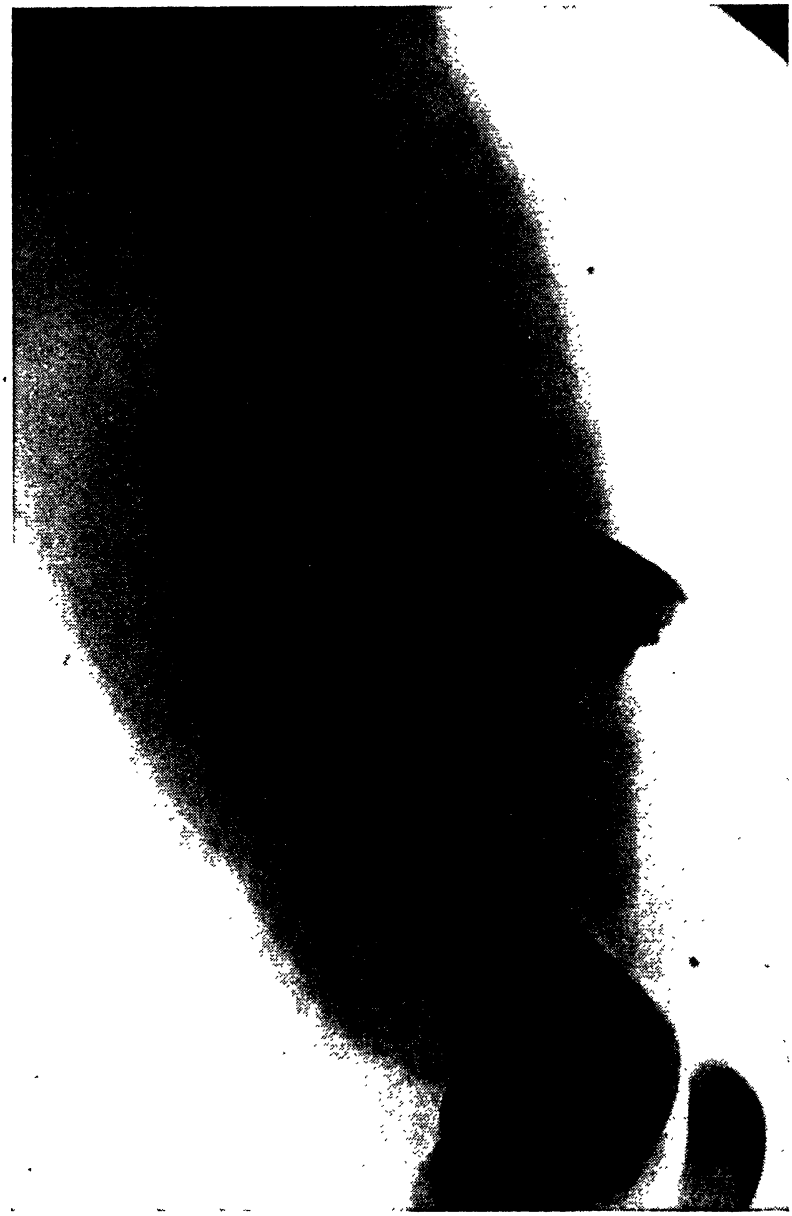

Fig. 3.—Compound comminuted fracture of the shaft of the femur in a motor cyclist who was knocked down by a motor car.

Undoubtedly the commonest fracture in the region of the wrist joint is the reverse Colles' fracture which is still called by many surgeons the " Chauffeur's fracture." These fractures occur most frequently to the inexperienced motorist who is attempting to start a car in which the self-starter has failed to act. It is important to emphasize that accurate reduction of the deformity under anæsthesia is necessary, if a good functional result is to be obtained. The limb is fixed in plaster of Paris for a period of four weeks as a rule, after which the

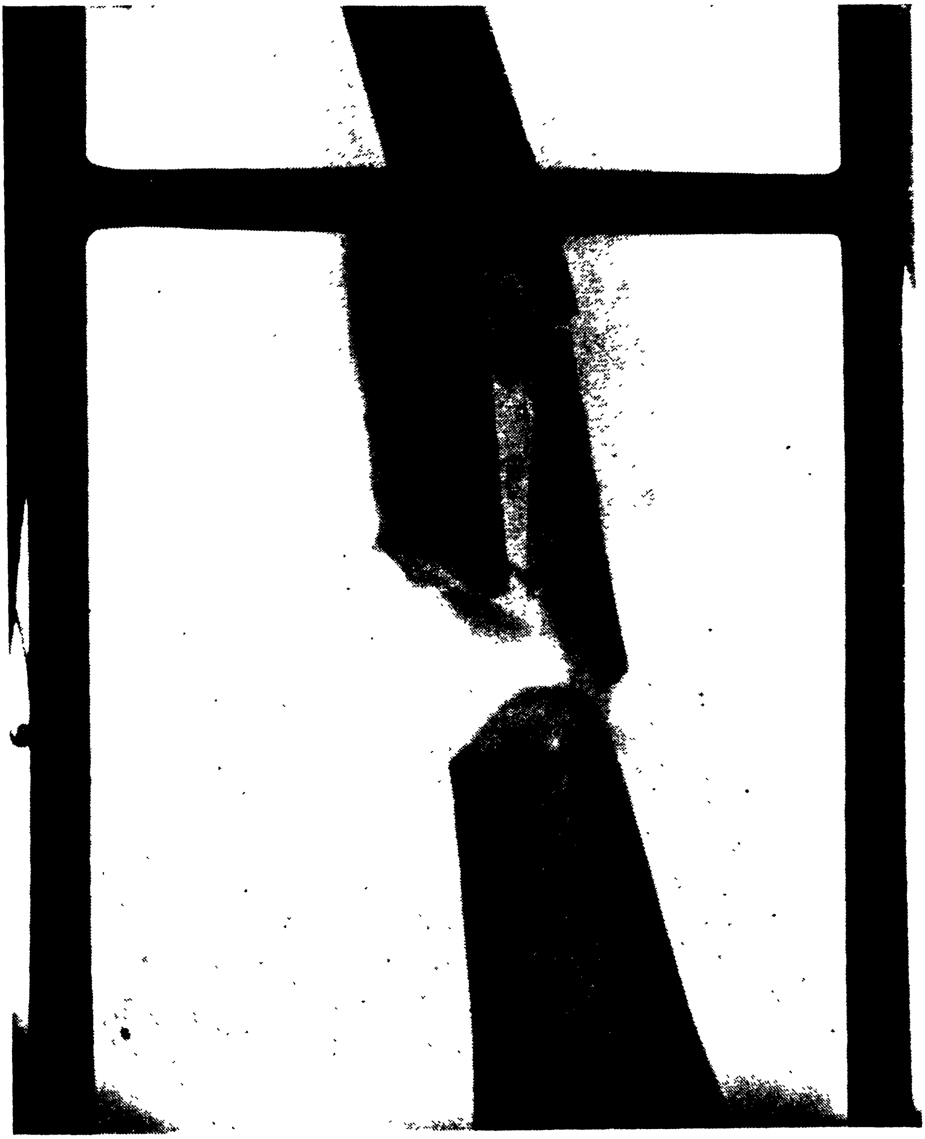

Fig. 4.—The same fracture as the one shown in Fig. 3. The fracture has been pulled out by the use of skeletal traction with a Kirschner wire through the condyles of the femur.

plaster is discarded and the patient is permitted to start using the limb. In this connexion it should be remembered that a sprained wrist is by no means unusual. In such cases, the patient while cranking a car, sustains a severe contusion of the wrist joint which may leave him with a weak and painful wrist for a long period of time. Such cases do best if they are immobilized in plaster of Paris so as to give complete rest to the affected joint for a period of two to three weeks, after which, the limb can be used without fear of the persistent pain and weakness so commonly seen.

## RISKS TO THE DRIVER

Injuries to the driver of the car are by no means uncommon. In the first place, cases occasionally occur in which some other moving vehicle strikes the driver's outstretched hand when he is indicating some change in the direction of his car. From his position behind the steering wheel the driver is occasionally thrown forward forcibly on to the wheel as he suddenly applies his brakes when driving at high speed. The force of the blow of the steering wheel on to the front of the driver's chest frequently results in a severe contusion of the chest, although at times fractures of the sternum and complete depression of the front of the chest wall have been recorded. A step has been taken in which injuries of this type can be minimized by the provision of a telescopic arrangement in the steering column which makes it possible for the steering wheel to move up and down in telescopic fashion when any sudden pressure is placed upon it. Such an arrangement is desirable, and perhaps some day it will be used more generally in motor vehicles.

Before the provision of unsplinterable glass in the wind-screen of a car, severe facial and head cuts and eye injuries were not unusual when the driver and passenger were thrown violently against the wind-screen. The result of the introduction of the so-called " safety glass " for such purposes has been that such cuts are nowadays unusual. On the other hand, fractures of the skull resulting from direct violence, and less severe head injuries leading to cerebral concussion, are occurring with greater frequency following injuries of this type. Attention should be drawn to the fact that a curious tattooing of the skin is a possible end-result in cases of severe skin wounds. It is believed that the presence of particles of oil and carbon in the wound are responsible for this. Adequate excision and cleaning of all wounds sustained when motoring are strongly urged to prevent this possiblity.

Fractures of the mandible and dislocations of the temporo-mandibular joints occasionally follow a severe blow on the mandible when the patient is thrown forward against the wind-screen. The services of a skilled and experienced dental expert are unquestionably necessary for such cases.

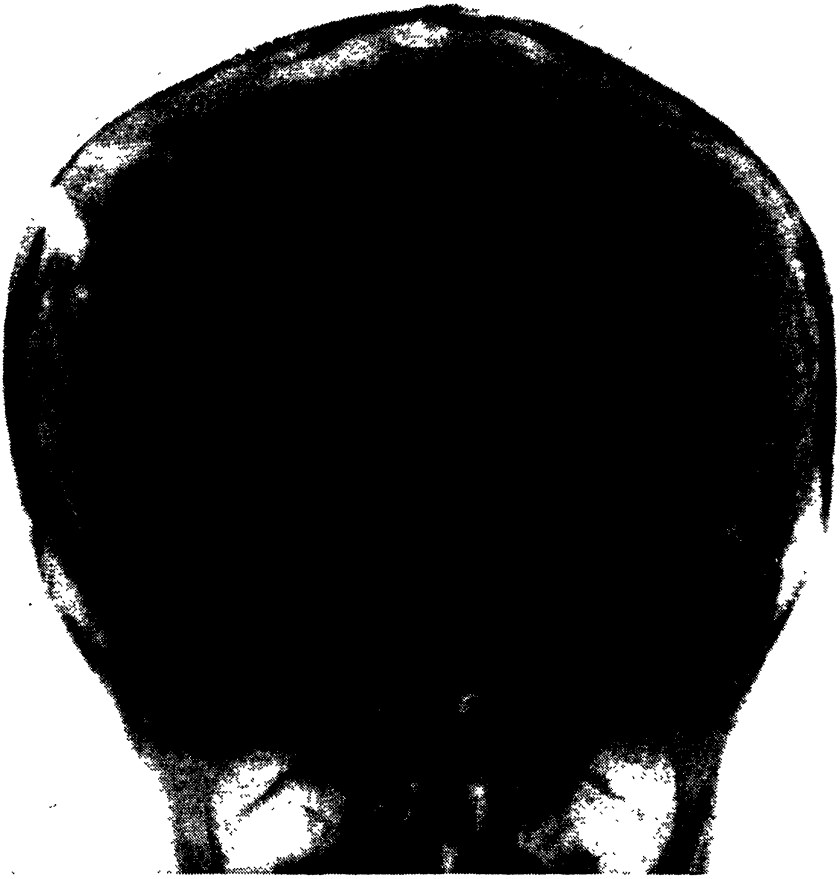

FIG. 5.—Extensive fracture of the vault of the skull in a patient who was thrown forward against the windscreen.

Another interesting fracture is one of the patella, in which the patient sustains a sharp direct blow to the patella when being thrown forward against the dash-board. A few such cases have been seen and are usually stellate fractures.

### RISKS TO THE PASSENGERS

The passengers seated in the back seat of a car are unfortunately not immune from injury, and only too frequently cases have occurred in which following a motoring accident the passenger has been seriously injured and has in fact died, whereas the driver has not sustained any injury worth recording. The well sprung back seat and a fast moving car traversing a bumpy road have before now resulted in a passenger being thrown upwards against the roof of the car and sustaining severe cerebral concussion. In addition, three cases of elbow dislocations have been seen as a result of a sudden impaction between the patient's elbow and the front seat when the passenger has been thrown violently forwards in a car accident.

### LORRY DRIVERS

Certain types of injuries are not unusual in which high motor lorries are involved in accidents. In the industrial areas cases are fairly frequently seen in which a workman perched on the top of a large lorry or van has been thrown from his seat and has fallen heavily on to his heel. This has resulted in a fracture of one or both os calcis bones, and is classically associated with an upward displacement of a large posterior part of the bone. The eventual outlook in such cases is generally regarded as being poor, since it is felt that such patients usually get a painful heel which prevents adequate weight bearing by the foot. When the deformity is adequately reduced by the insertion of a Kirschner wire through the os calcis and through the shaft of the tibia, followed by the use of a proper screw-traction apparatus, and by the subsequent application of plaster of Paris to the limb for a period of several months, excellent function results, and the patient has a painless heel on which he can easily walk.

### CONCLUSIONS

In summing up the position, therefore, it would appear that such motoring injuries as have been referred to in this article are usually best dealt with in a modern fracture clinic such as are now being established in conjunction with most of the general hospitals in this country. It has not been possible to do more than touch on many of the possible motoring injuries, but the majority of the more important ones have been referred to. A further appeal may be made to the motor car manufacturers to co-operate with the medical profession in the construction of the cars of the future so as to prevent or lessen the possibilities of the serious injuries we have discussed.

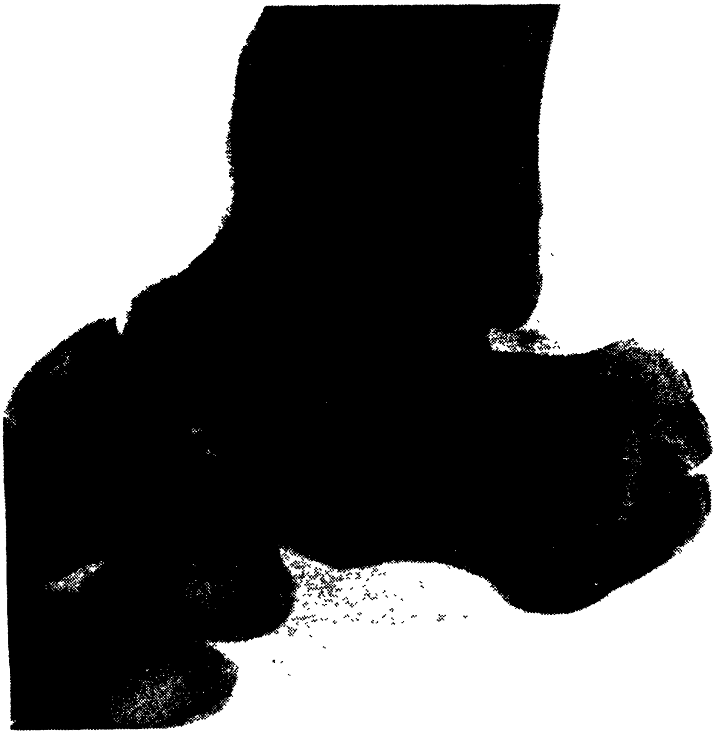

FIG. 6.—A fracture of the os calcis in a workman who was knocked off the back of a motor lorry and fell heavily on to one heel.

I am much indebted to Mr. J. A. McLauchlan, F.R.C.S. and to Mr. Neil Beaton, F.R.C.S. for assistance in collecting the statistics included in this paper.

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# ADMINISTRATION OF FLUIDS

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THE particular aspect of the subject of fluid administration here to be considered concerns the technique of the special, i.e. non-oral methods of administering fluid, namely, intravenous, rectal, subcutaneous, and intraperitoneal. All these methods are of great importance in that, properly used, they can save the lives of many patients and reduce the suffering of many others. All are relatively simple to carry out and should be within the compass of every practitioner.

## INDICATIONS

The non-oral administration of fluid is indicated :—(1) As an emergency measure to restore blood volume in acute hæmorrhage; (2) To restore water balance in patients suffering from water deficit (dehydration) *who are unable to drink enough.*

### (1) *ACUTE HÆMORRHAGE.*

It is unnecessary to enumerate the many well-known conditions, medical, surgical, gynæcological and obstetrical, which may give rise to acute bleeding. The symptoms are also too familiar to need repetition. For the purpose of the restoration of blood volume in acute hæmorrhage the fluid should be introduced intravenously. The best fluid is blood, but if this is not available an intravenous infusion of normal saline may tide over the emergency. Bayliss (1918) advised the use of gum-acacia solutions, isotonic with blood, as producing a more lasting effect than simple saline solutions. Recently, however, Studdiford (1937) has published a warning of the dangers attending the use of gum solutions and states that normal saline is safer.

### (2) *DEHYDRATION.*

Dehydration is a state of water depletion arising from the water output of the body exceeding the water intake. Perhaps the most important of all recent advances in medicine has been the growing recognition of the vital part played by dehydration in many diseases. Much of the knowledge in precise form, especially that derived from the important researches of Coller and Maddock (1932, 1933, 1935, 1936), is recent.

*Causes.*—(A) Inadequate provision of fluid: (i) Deliberate denial or restriction of fluid for therapeutic reasons, correct or mistaken, e.g. following upon hæmatemeses or melæna; after operations upon the stomach. (ii) Neglect by nurses or relatives—a rare cause except sometimes under conditions of great overwork.

(B) Inability to swallow: (i) Dysphagia due to lesions affecting the upper alimentary tract, e.g. quinsy, diphtheria, corrosive poisoning, carcinoma of the œsophagus, bulbar palsy. (ii) Coma or delirium, e.g. meningitis, severe toxæmias, head injuries, cerebral vascular lesions, diabetic coma, narcotic poisoning, delirium tremens, insanity. (iii) Great weakness: extremely toxic or enfeebled patients cannot make their need for water effective. Thirst, the normal protection against dehydration, loses its insistence, and their weak state renders the satisfaction of even such thirst as they do feel an intolerable effort. They really cannot rouse themselves to the exertion of drinking; a few sips and they give up and feebly shake their heads. This cause of dehydration is of the greatest practical importance from its occurrence in many severe illnesses and post-operative states, and generally escapes recognition. A few outstanding examples are pneumonia, typhoid, gross septic states, and major operations.

(C) Increased fluid output:—(i) Vomiting: Great loss of fluid may occur from severe vomiting, particularly if combined with diarrhœa. The most important causes of severe vomiting are gastritis, appendicitis, peritonitis, intestinal obstruction, pyloric stenosis, raised intracranial pressure, Addison's disease, hysteria, poisoning. (ii) Diarrhœa : Profuse loss of fluid from severe diarrhœa may be due to colitis, cholera, dysentery, enteritis, thyrotoxicosis, and poisoning. (iii) Sweating : Dehydration from sweating is not frequent under ordinary clinical conditions. It is sometimes caused by the excessive heat to which unconscious patients may be exposed under hot cradles for many hours. (iv) Biliary and intestinal fistulæ. (v) Exudation from extensive raw areas, e.g. burns.

*Symptoms and signs of dehydration.*—The symptoms of conscious patients are thirst and weakness. When dehydration is severe, they become feebly delirious and cease to complain. The most easily recognized sign of dehydration is a dry tongue and mouth due to diminution of salivation. Any patient, not continuously mouth breathing or under the influence of drugs of the atropine group, who has a dry mouth is dehydrated. This dryness of the mouth paves the way for, and in time sets up, stomatitis and even parotitis. Most of the effort spent by nurses in meticulous attention to the toilet of the dry mouths of seriously ill patients would be unnecessary if dehydration were prevented. As dehydration progresses, the expression becomes sunken from loss of fluid from the subcutaneous tissues and, from desiccation of these tissues, the skin all over the body becomes inelastic so that when a fold is pinched up it fails when released to return in a normal manner. In the non-diarrhœal cases the dryness of the gut causes constipation which may be extremely obstinate. Attempts to move the bowels of dehydrated patients with powerful aperients are misguided, for any success only aggravates still further the water depletion. The effect upon the bowels of adequate fluid administration in many post-operative states of so-called paralytic ileus is sometimes remarkable.

From the onset of dehydration the output of urine falls; a daily output of 600 c.cm. is necessary in the average adult to secure solution of the waste products to be excreted (Lashmet and Newburgh, 1932). At first the kidneys excrete this amount of water at the expense of the tissues, but after a time this is no longer possible. The daily output sinks below

600 c.cm. and retention in the blood of urea and other waste products ensues. The pulse and blood pressure are not at first affected because the blood maintains its volume as long as it can withdraw fluid from the tissues. Later, however, the water content of the blood diminishes (anhydræmia), the blood volume is reduced, the blood pressure falls, and the pulse rate rises.

*Is dehydration common?*—The answer depends on whether or not the manifestations described above are common in the numerous conditions which have been listed. Few will deny that dry mouths and concentrated urines, the earliest signs of dehydration, are often seen in all the conditions mentioned. They indeed figure prominently in the classical descriptions of these morbid states. It may, however, be contested that a dry tongue and scanty urine do not represent a water shortage of any serious degree. In a series of most careful gravimetric studies Coller and Maddock (1935) recently showed that these early manifestations of dehydration appear when the water deficit amounts to 6 per cent. of the body weight. In an adult normally weighing 10 stones (140 pounds or 64 kgm.) this weight loss represents a volume of water of 6¾ pints (3·8 litres). Can it be doubted that such a water depletion must seriously add to the harm produced by the primary cause of the illness?

The later (anhydræmic) manifestations of dehydration are far from rare in the above conditions. They are, however, usually ascribed to toxæmia. It is true that a fall in blood pressure and tachycardia are often due to toxæmia, but probably more often still they are due to dehydration rather than to toxæmia. The two causal factors react adversely upon one another, and the addition of dehydration to toxæmia sets up a vicious circle which can be broken so far as dehydration is concerned, whereas the toxæmia may be difficult to combat directly.

To sum up: It is submitted that dehydration, slight, moderate and severe, is common in the considerable number of important conditions mentioned. This dehydration is harmful to the patients and results in avoidable deaths and much suffering. Further, dehydration is common in patients otherwise under excellent care. This statement is provocative; if true, it raises the question why this deplorable state of affairs has arisen. The fault appears to lie in a curious general blindness to the immense importance of water, and failure to apply with any degree of precision the well-known facts of water balance as set forth by physiologists for many years (Rowntree, 1922). It is indeed remarkable that while students are expected to know the exact doses of numerous drugs of most doubtful value, yet they are seldom if ever instructed about the water requirements of the normal or sick individual.

*Prevention and relief of dehydration.*—The prevention of dehydration in the average adult patient who is not taking solid food will be achieved by the daily administration of 3,500 c.cm. or approximately six pints. This figure has been carefully worked out in practical determinations by Coller and Maddock (1933). An ordinary "solid" diet provides the body with a litre of water daily because most foods are largely composed of water; this amount must be compensated for in patients on fluids only. Further, the need of water during illness is often greater than in health. These facts account for the apparently high figure of six pints. During abnormal losses, such as are due to vomiting and diarrhœa, the patient requires the amount thus lost in addition to the six pints. Relief of established dehydration requires in the average adult the administration of about twelve pints (7 litres) of fluid during 24 hours (Coller and Maddock 1933, 1935), i.e. the amount of fluid deficit plus the ordinary daily requirement. If abnormal losses continue during the period of hydration the volume of these must be added to this figure. Observation of the urinary output is a most valuable check on the patient's water balance. A daily output of 1,200 to 1,800 c.cm. or 2 to 3 pints should be aimed at. In conditions of severe dehydration the beneficial effect of really adequate quantities of fluid can appear miraculous.

Fluid administration must, of course, be tempered by discretion about waterlogging. Observation of the urinary output is one of the best safeguards. *Oral administration is best if practicable.* It is hardly necessary to point out that the congestive and œdematous states fluid restriction rather than augmentation is indicated.

## TECHNIQUE

*Intravenous administration of fluid.*—Fluid may be administered intravenously for the purpose of restoring blood volume after acute hæmorrhage or for the restoration of water balance in actual or potential dehydration. For the former purpose normal saline, failing blood, is the most convenient fluid. In dehydration, however, it is undersirable to administer much intravenous saline unless chloride is being lost in abundance by vomiting or sweating. Isotonic glucose solution is preferable, as it does not tend to produce œdema and also supplies a certain amount of nourishment (Coller, Dick and Maddock, 1936). Normal or isotonic saline contains 0·85 per cent. of sodium chloride. Isotonic glucose solution contains 5·0 per cent. of glucose. In an emergency, solutions may be prepared with tap water and then boiled to sterilize them. Solutions prepared with tap water, however, are extremely likely to produce pyrexial reactions and rigors. When such solutions were in common use at the Middlesex Hospital reactions of this nature occurred in almost every other case.

The reactions are due to the presence in the solution of bacteria which, though killed by the boiling, act as foreign protein when introduced into the patient's circulation (McIntosh, Fildes and Dearden, 1912; Siebert, 1924; Hunt, *et al.*, 1927; Rademaker, 1930; Banks, 1934). They can only be eliminated by proper distillation of water. It is essential that the still used be fitted with a spray trap so that only water vapour passes over into the condensing chamber. Immediately the water has been distilled the solution should be prepared, bottled, sealed and sterilized. At the Middlesex Hospital the bottles containing the solution are sealed with screw caps and then autoclaved for an hour at a pressure of steam of five pounds to the square inch. Since this was adopted the incidence of reactions has fallen to 1·7 per cent. Most leading manufacturing chemists now supply properly prepared saline or glucose solutions in sealed pint- or quart-size containers which are convenient and cheap and keep for years.

In order to make the description of technique as practical as possible it is assumed that the operator has to perform the administration in a private house and has therefore to bring everything with him. He will need to go equipped with :—(A) A dressing tin containing his sterile apparatus; (B) A box or bag containing the other necessary apparatus. It will be further assumed that when he reaches the house he will not have any trained assistance, and hence, the steps of his technique must be so arranged as to dispense with help.

The apparatus to be described depends for its motive power on gravity. When set up its general appearance is as illustrated in figure 1. The only part of the apparatus which the operator cannot conveniently take with him is the pole to support the reservoir. His first step on entering the house must therefore be to requisition from the household a broomstick or other pole.

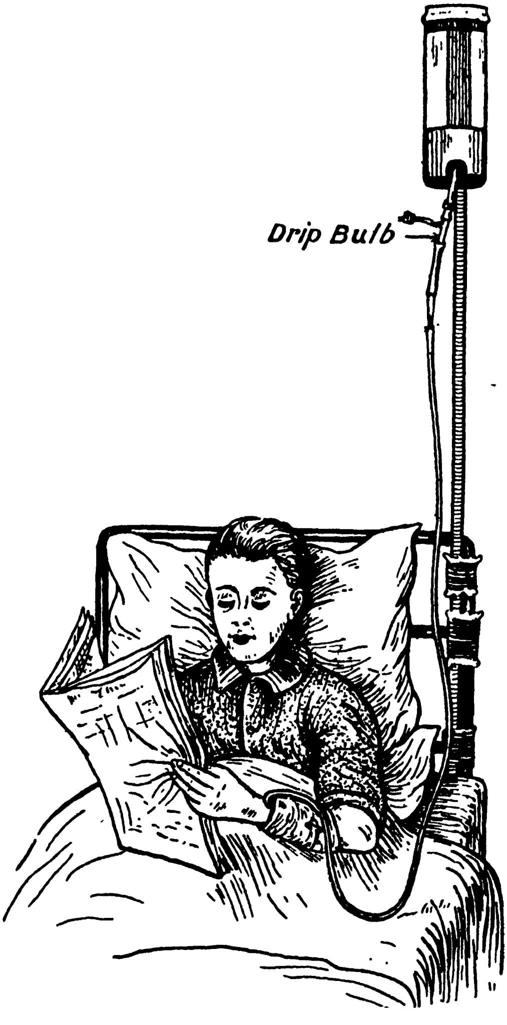

Fig. 1.—General view of intravenous infusion.

(A) CONTENTS OF DRESSING TIN. The items are depicted in Figure 2 and there numbered according to the list below. The intravenous administration of fluid involves introduction into a vein of either a needle or a cannula. For administrations lasting for a short time a needle is usually quicker and more convenient; when, however, the administration has to be maintained for several days or many hours it is better to tie a cannula into a vein to obviate the possibility of the needle slipping through the vein wall. The description below deals with both methods; needles, however, are not included in this list because they are best carried in spirit in a test-tube in Box B, as they tend to become rusted and their lumina occluded if submitted to steam baking. The practitioner should keep the dressing tin ready packed and sterilized (by baking). The content of the tin should be packed into it in the following order so that the first-named items are at the bottom of the tin :—(1) A roll of 3-inch wide bandage. (2) A supply of wool and dressing. (3) Instruments required for cutting down on a vein :—2 c.cm. hypodermic syringe; ampoule of 2 per cent. novocain and file; scalpel; small pair of toothed dissecting forceps; small pair of non-toothed dissecting forceps; 2 pairs of fine Spencer Wells (spider) forceps; 2 pairs or ordinary Spencer Wells forceps; a small piece of rubber tube, ⅛ inch in external diameter and 4 inches in length; a reel of No. 2 silk; a straight cutting surgical needle; a pair of dissecting scissors. (4) A dozen gauze swabs, about 3 inches square. (5) Cannulæ:—2 ordinary tapering cannulæ; 3 Kekwick cannulæ of different sizes (see Fig. 3). (6) A 2 c.cm. hypodermic syringe fitted with a side-arm on the barrel (*see* Fig. 6). (7) Six feet of "aspirating tubing." This is rubber

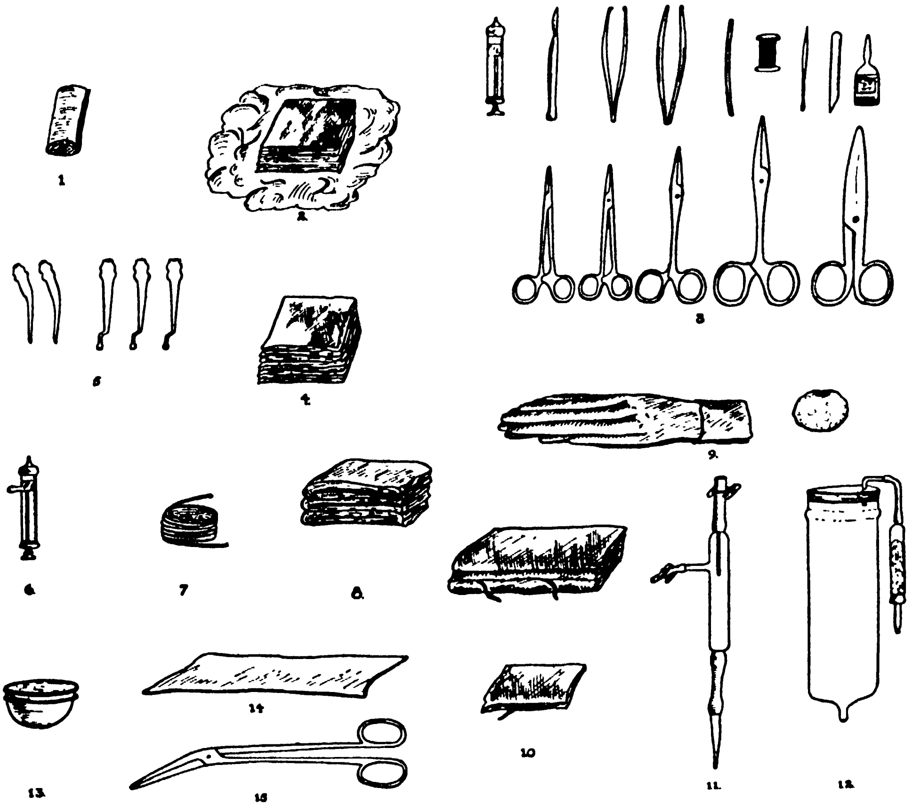

FIG. 2.—Composite picture of apparatus required for intravenous infusion.

tubing of 5 mm. external diameter with a thick wall and small lumen. (8) Three dressing towels. (9) A pair of rubber gloves and a sachet of powder. (10) Gown and mask. (11) A drip-bulb with rubber and glass connections as illustrated in Fig. 4. The rubber tubing attached to the upper end of the drip-bulb must be of a size convenient to fit on to the stem of the reservoir. All the rubber tubing must make air-tight connections with the glass parts. The screw clips must be left wide open because, if they are screwed up tightly, the walls of the compressed tubing will become stuck together during the process of heat sterilization. (12) Glass reservoir of 4-pint capacity provided with a rubber bung to fit it. The bung should be pierced by a short length of glass tube for the admission of air; the upper end of this tube should be attached to a wool filter. (13) Two small enamel bowls (about 4 inches in diameter), one of them containing a few swabs. (14) A dressing towel spread over the lot. (15) A pair of Cheatle's bowl forceps on the very top.

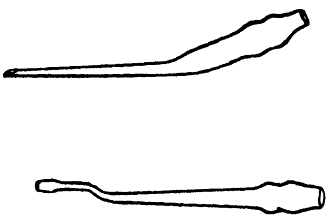

FIG. 3.—Cannulæ : ordinary tapering, and Kekwick.

### (B) CONTENTS OF BOX OR BAG.

Three bottles of normal saline solution, pint size. Three bottles of isotonic glucose solution, pint size. Plenty of tape or string. Pair of scissors. Square yard of mackintosh or rubber sheet. Sphygmomanometer. Wide-mouthed bottle containing methylated spirit; a half-pint milk bottle fitted with a rubber bung is convenient. Roll of elastoplast. Tin hanger for reservoir. Padded straight splint, 1 foot by 3 inches. Corked test-tube containing in methylated spirit :—3 large serum needles (sizes 1, 2 and 3); two fine hypodermic needles (size 20). If a few drops of glycerin are added to the spirit the needles will be prevented from rusting. A razor.

The operator arrives in the patient's room with dressing tin (A), box (B), and the pole he has borrowed. The first step is selection of a suitable vein. If a needle is to be used or if the infusion is urgent, it is desirable to use the largest possible vein. One of the antecubital veins will then be most convenient. If, however, a cannula is to be tied in and there is no desperate hurry it is better to use a vein in the lower forearm (Marriott and Kekwick, 1935) because there will then be no need to splint the arm and also no damage will be done to the antecubital veins nowadays so useful. In making the choice both arms should be inspected and the most convenient vein noted. When it is decided to use one of the veins in the lower part of the forearm, it will usually be found that one of the two main tributaries forming the cephalic vein is most convenient (*see* Fig. 5). Whatever vein is chosen the skin over it if hairy should be shaved.

The next step is to lash the pole to the head of the bed and then to tie the tin-can hanger to the top of it. The rubber sheet should now be spread under the patient's arm. The cuff of the sphygmomanometer is then applied around the arm above the elbow. The instrument is allowed to rest on the side of the bed at the head end with its face turned towards the operator.

A small table is now borrowed and placed close at hand. The dressing tin is placed on one side of this table and opened. Beside the tin is placed the uncorked bottle of methylated spirit. The Cheatle's forceps is picked out of the tin by the handles and then used to take out the upper contents of the tin; when it is wished to put the forceps down it is stood by the blades in the bottle of spirit. First the top towel is removed from the tin and laid upon part of the table. Upon it are placed the two enamel bowls. Into the one containing swabs

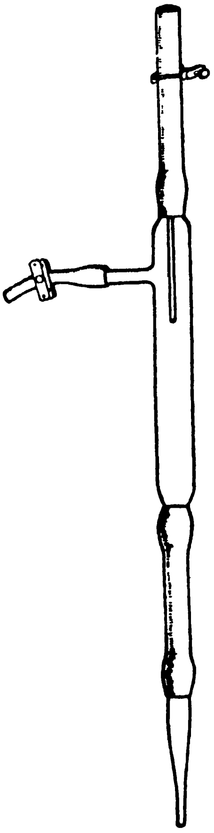

FIG. 4.—Drip bulb and connexions.

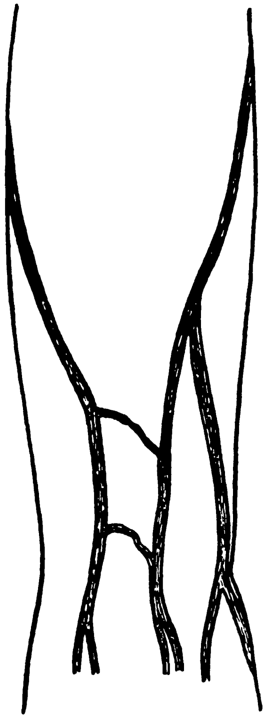

FIG. 5.—Origin of cephalic vein.

some spirit is poured from the Cheatle bottle; into the other is poured some saline from one of the bottles brought.

Now, with the aid of the Cheatle's forceps, the reservoir is lifted from the tin. The operator handles it with his unsterilized hands, but is careful to touch only the outside in its middle portion. The reservoir is inserted into the hanger. Next, the drip-bulb and its connexions are picked out of the tin with the Cheatle's forceps and may also be handled provided that the ends are not touched. The screw clips are screwed up, the one on the side-arm tightly the other lightly. The upper rubber tube is dipped in saline to moisten it and then connected to the reservoir. The remainder of the saline in the opened bottle is now poured into the reservoir.

The patient's arm for a wide region around the selected vein is thoroughly swabbed with spirit. The swabs used are thrown away, leaving the enamel bowl from which they came containing spirit only. Into this bowl is poured the spirit and needles from the test-tube brought in box B.

Three strips of elastoplast, each 3 inches by ½ inch, are cut and placed, sticky side up, on the table beside the tin.

The operator now scrubs up as for a surgical operation. He returns to the tin and picks out the rubber bung with his scrubbed hands and inserts it into the reservoir. He then dons the mask, gown and gloves. He takes the towels from the tin and isolates the selected vein with them. The aspirating tubing is connected at one end to the glass connexion depending from the drip-bulb. The other end is allowed to rest upon the towels. To what it is to be connected will depend upon whether a needle or cannula is to be used. If the former, then it should be connected, after moistening with saline, to the side-arm of the special type of hypodermic syringe (Fig. 6). The syringe is so designed that the piston when pushed down occludes the side-arm opening into the barrel; on the other hand, when it is withdrawn the side-arm is in free communication with the barrel. One of the large serum needles is connected to the syringe. The operator now, using a piece of gauze to avoid soiling his hand, fully unscrews the screw clip above the drip bulb. He then withdraws the piston of the syringe and allows enough saline to run through to displace all air from the tubing except that caught in the intentional air-lock in the drip-bulb; he stops the flow by pushing down the piston.

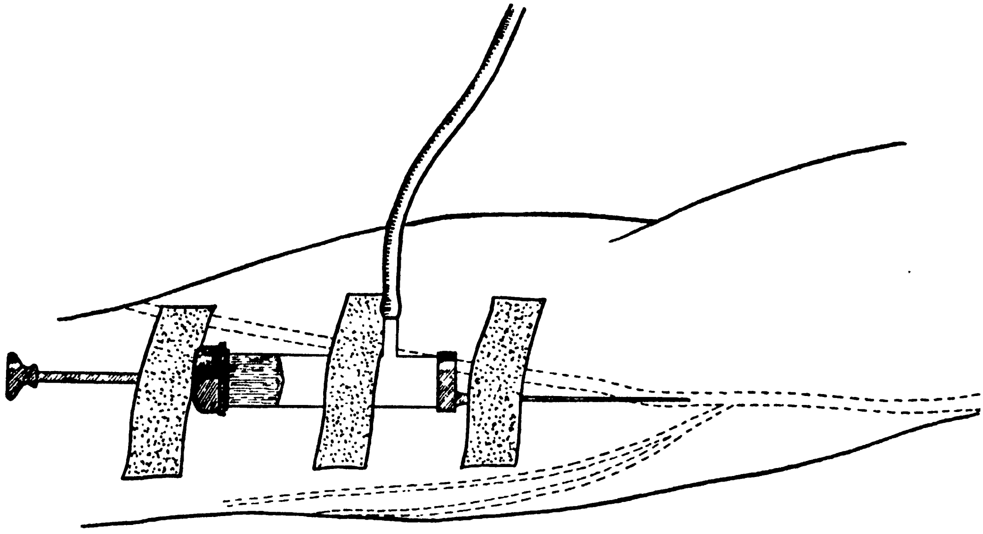

FIG. 6.—Side-arm syringe strapped to forearm.

The sphygmomanometer cuff is now inflated to a pressure of 50 mm. Hg by manipulation of the bulb and screw through the towel. This manœuvre renders the antecubital veins more prominent. The needle is inserted into the selected vein in the usual way. Entry into the lumen is indicated by a flow of blood into the barrel on pulling back the plunger. The sphygmomanometer cuff is immediately deflated, and the plunger further withdrawn until the side-arm is in communication with the barrel. A glance up at the drip-bulb should show the saline to be running freely. If so, the syringe is strapped with the elastoplast to the forearm as shown in Fig. 6. The final step is to apply dressings and wool, to be found in the bottom of the tin, and bandage to the back of the elbow the splint brought in box B.

If a cannula is to be used the technique is as follows: First a suitable cannula is selected. When speed is the prime consideration it is desirable to use a tapering cannula (*see* Fig. 3) which is the easiest to insert. One of the antecubital veins should be used as being the easiest; presumably in the particular case even these veins are none too easy, or else a needle would be used. If there is not any desperate urgency it is better to use a Kekwick cannula and a lower forearm vein. The advantage of the Kekwick cannula (Marriott and Kekwick, 1935) is that it has a bulbous end, which, though it makes insertion more difficult, renders its tying into a vein secure. The particular advantage of lower forearm veins, as already explained, is that they obviate the necessity for splinting and so add considerably to the patient's comfort if the administration is prolonged over many hours or several days.

When the cannula is selected it is connected, after moistening with saline, to the lower end of the tubing. Then, as above, saline is allowed to flow through to expel air. The flow of saline is conveniently stopped by clipping one of the pairs of artery forceps across the tubing. The remainder of the instruments are removed from the tin and laid upon the towels. The skin over the vein is given one more swabbing with spirit.

The vein is rendered prominent by inflation of the sphygmomanometer cuff as described above. The ordinary hypodermic syringe is connected to one of the fine needles and, after being given a rinse through with saline, is filled with novocain from the ampoule. By intradermal injection of the novocain a wheal ½ inch in diameter is raised over the chosen vein, the remainder of the syringeful is injected into the subcutaneous tissue around the vein.

With the scapel a transverse incision is made through the skin over the vein which is then exposed by blunt dissection with a pair of spider forceps. The points of the closed forceps are thrust under the vein and used to pull back under it the small piece of rubber tube which then serves to maintain the vein presented up out of the tiny wound (*see* Fig. 7). At this point the cuff of the sphygmomanometer is deflated by manipulation of the screw through the towel. The spider forceps is again thrust under the vein and used to pull back a ligature which is tied round the distal end of the vein and the ends left long. In a similar manner another ligature is passed around the proximal end of the vein but is not tied, the ends being clipped together by the second pair of artery forceps.

The vein is now opened by a transverse cut through the upper semicircle of its wall, disclosing the shining intima. Any bleeding is controlled by traction on the untied ligature. The entry into the proximal part of the vein is held open for the reception of the cannula in the following manner (*see* Fig. 8). The tip of one blade of a pair of spider forceps is introduced into the right-hand side of the vein and then clipped on to the wall and left exerting gentle traction by its weight. With a pair of non-toothed dissecting forceps in his left hand the operator grasps the left-hand wall of the vein and holds open the lumen while with his right hand he slips in the cannula.

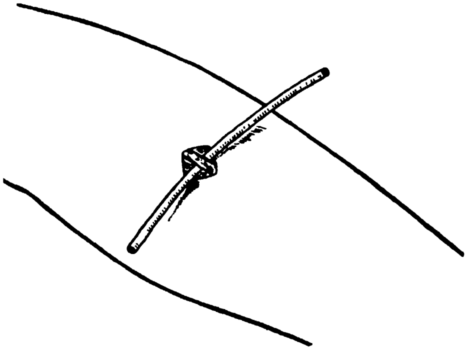

FIG. 7.—Slip of rubber tube presenting vein out of wound.

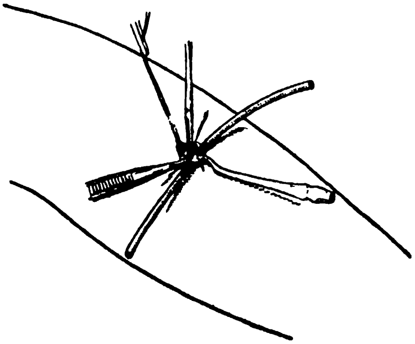

FIG. 8.—Inserting the cannula.

Immediately the cannula is in the vein the proximal ligature is tied over it; in the case of a Kekwick cannula this ligature is tied around the vein just behind the bulbous tip of the cannula but in front of the bend. The distal ligature is also tied around the body of the cannula. Both ligatures are then cut, leaving ends of about an inch length. The small piece of tube is removed.

The artery forceps occluding the tubing is unclipped and saline should be observed flowing rapidly through the drip-bulb. The cannula and adjacent tubing are affixed to the forearm by strips of elastoplast. Dressings and wool are then bandaged over an area of three inches above and three inches below the wound; *the bandage must not be tight enough to compress the vein above the cannula.*

The drip-bulb forms a useful visible flow-meter and it should be remembered that a rate of 40 drops per minute is equivalent to a flow of a pint (568 c.cm.) in four hours. Occasionally the level of the fluid in the drip-bulb creeps up until it fouls the dripper. The level can be lowered by screwing off the regulating clip and momentarily opening the clip on the side-arm—this is the sole purpose of the side-arm.*

When intravenous administration is prolonged phlebitis inevitably affects the vein being used in from two to seven days; it develops earlier in the case of glucose than saline. The patient complains of pain, especially if the drip is accelerated. Red and tender induration in the line of the vein slowly creeps up the arm. The temperature may rise. The phlebitis appears to be an irritative and not an infective phenomenon. When it *begins* the cannula should be changed into a vein in the other arm. Persistence with the same vein may cause a very painful arm and sharp constitutional disturbance.

If the administration is too fast, circulatory overloading may occur and pulmonary œdema develop with grave danger to life. The first signs are development of a persistent cough and the appearance of râles at the bases. Watch for these manifestations should always be kept. If they appear the administration must be stopped at once.

*Rectal administration of fluid.*—The great advantages of rectal administration, among the non-oral methods, are that neither the fluid used nor the apparatus need be sterile and the administration can be carried out by nurses. To J. B. Murphy of Chicago (1909, 1916) belongs the credit of evolving the correct technique for continuous proctoclysis. Most unfortunately, the principles he laid down over thirty years ago have been largely lost, with the result that the method has fallen into disrepute. Even in 1909 Murphy, in his own country, stated "I have been surprised in visiting hospitals to be told that patients did not retain the fluid. This was undoubtedly true, but failure to retain it was because it was not properly administered." We did not believe it possible that patients could retain adequate quantities of fluid from rectal administration until Murphy's original papers were consulted. There we were astounded to read :

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*The various special pieces of apparatus mentioned above are obtainable from Messrs. John Bell & Croyden, Wigmore Street, London, W.1.

> "The quantity administered depends upon the severity of the case, the age of the patient and other considerations that will suggest themselves in the particular instance. The average, however, is eighteen pints in twenty-four hours; that is a pint and a half every two hours. A quantity less than eight pints is, I believe, of little value. In a child of eleven as much as thirty pints have been administered in twenty-four hours without escape of fluid."

The United States standard pint to which Murphy refers is 470 c.cm. as compared with the 570 c.cm. of the imperial British pint. Since reading the above statement we have applied Murphy's original principles and amply confirmed his claims.

The essential point is that pressure within the rectum should not be raised to any appreciable extent. If it is, the anal sphincter will inevitably relax and the fluid be voided. Murphy appreciated that the dangerous cause of a rise of intra-rectal pressure during proctoclysis is accumulation of flatus above the fluid being introduced. The accumulating pressure due to flatus is periodically reinforced by peristaltic contractions of the wall of the large bowel. *In order to attain success the apparatus must be so constructed that flatus can escape freely back into the reservoir.* There must not be any constriction between the tip of the nozzle in the rectum and the reservoir. The opening or openings in the nozzle must be large. The tubing from it to the reservoir must have an internal diameter of not less than three-eighths of an inch, and should be pressure-tubing so that it may not be accidentally constricted. There must be no clips or drip-bulbs or any other form of constriction of, or inserted in, the tubing. The outlet of the reservoir must not be narrower than the lumen of the tubing. It will be obvious that, if there is no constriction in the tubing, the reservoir must be suspended at a relatively low height otherwise all the fluid will rush in rapidly, hydrostatically raising the intra-rectal pressure and act as an enema. In point of fact, the slow flow of the fluid must be regulated entirely by the height of the reservoir. Murphy stated: "The fluid should never have a headway of more than fifteen inches hydrostatic pressure, and the best and most uniform results are given at four to seven inches." Quite apart from the question of the slow regulation of the flow, it will be apparent that flatus will not easily bubble back into the reservoir if the hydrostatic pressure of the fluid is any higher.

To recapitulate, the essential points of the Murphy technique are :—(1) No constriction whatever between reservoir and rectal nozzle; (2) The height of the fluid in the reservoir never to be more than fifteen inches above the anus, and preferably four to seven inches only.

The simple apparatus necessary is shown in Fig. 9, and an enlarged view of Murphy's rectal nozzle in Fig. 10. The nozzle may be of glass or vulcanite, preferably the latter. When it is inserted into the rectum it occupies the position shown in Fig. 11.

The fluid to be administered depends on the needs of the patient; it may be either water, or isotonic saline or isotonic glucose. It should be remembered that excessive administration of saline is apt to lead to œdema (Coller, Dick and Maddock). Unless there is much loss of chloride from vomiting or sweating it is advisable that not more than one pint in every four administered should be saline. As regards the administration, Murphy's words may be quoted :

> "The proctoclysis is usually continued for three days; rarely as long as five or six. It is best administered in the Fowler position. The best plan is to place a pint and a half (a pint and a quarter British measure) of the solution in the container every two hours. The container should be elevated sufficiently (usually six inches above the anus) to allow this all to flow into the rectum in forty to sixty minutes, giving the rectum a period of rest from the influx of fresh fluid for approximately an hour before it flows again."

The nozzle is not withdrawn during the period of rest. The stem of the nozzle and the tubing should be strapped to the thigh (*see* Fig. 12). In some cases it may be necessary to adjust the height of the reservoir somewhat frequently.

*Subcutaneous administration of fluid.*—We have little personal experience of this method. It has the disadvantages that fluid can only be administered slowly and under imperfect control, and necessitates much of the complicated preparation involved in the intravenous route. The apparatus traditionally employed is depicted in Fig. 13. It must all be sterile, and the sterile fluid used should be prepared as described under intravenous administration. The anterior axillary regions are generally stated to be the best. The needles employed should

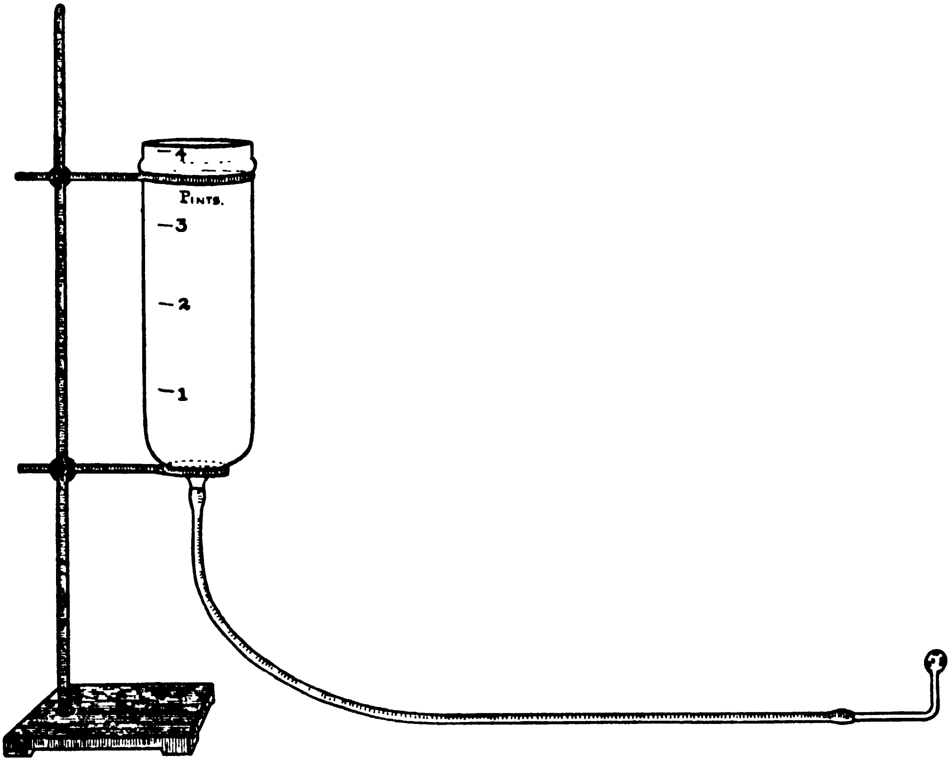

FIG. 9.—Apparatus for rectal infusion.

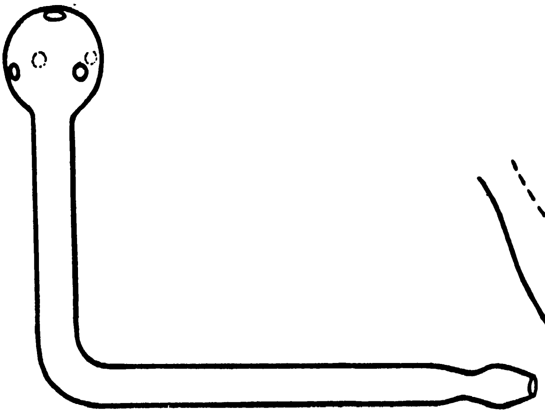

FIG. 10.—Murphy rectal nozzle.

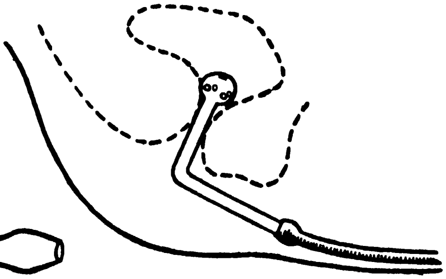

FIG. 11.—Rectal nozzle in position.

be serum needles of medium size. The rate of flow, with two needles, in an adult, should not exceed 100 c.cm. per hour. A faster rate entails the danger of a pressure gangrene of the tissues.

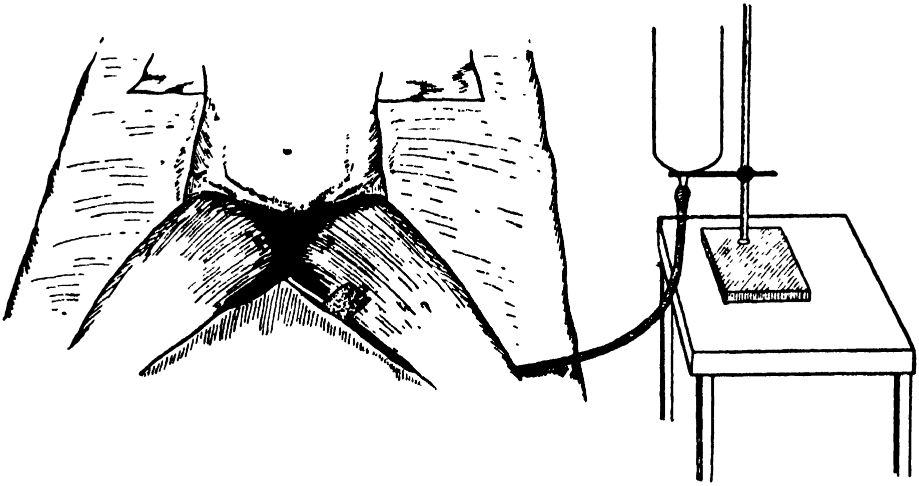

Fig. 12.—General view of rectal infusion (Murphy).

*Intraperitoneal administration of fluid.*—The intraperitoneal route is only used in children, but is then valuable. It introduces fluid rapidly into the circulation when the intravenous route is difficult on account of the small size of the veins: 40 to 60 per cent. of the injected fluid is absorbed within an hour. The remainder of the fluid is slowly absorbed during the next six to ten hours. The disadvantages of the method are that after repeated injections absorption becomes slower and, it is alleged, that the danger of peritonitis increases. It is certain that two injections within four hours are possible.

The sterile apparatus required is as follows :—

2 dressing towels.
A porringer containing methylated spirit.
Swabs.
A porringer large enough to hold a pint.
A lotion thermometer.
A 20 c.cm. Record syringe.
A size 4 serum needle.

The fluid used should be prepared as described in connexion with intravenous administration. It should be injected at a temperature of 100° F. The operator is scrubbed up, and a nurse acts as an assistant and holds the baby still. She bares the infant's abdomen which is cleaned with spirit. The best site for injection is half an inch below and to the right of the umbilicus, because it is sufficiently high to avoid the risk of the needle perforating the urinary bladder and because the needle pierces the rectus muscle which closes the track left after withdrawal of the needle. The site of injection is isolated with the towels ; the syringe is filled with the injection fluid, and the operator raises a fold of skin over the site of the proposed injection with his left hand. With his right hand he introduces the needle, attached to the syringe, into the subcutaneous tissues in an upward direction. The fold of skin is

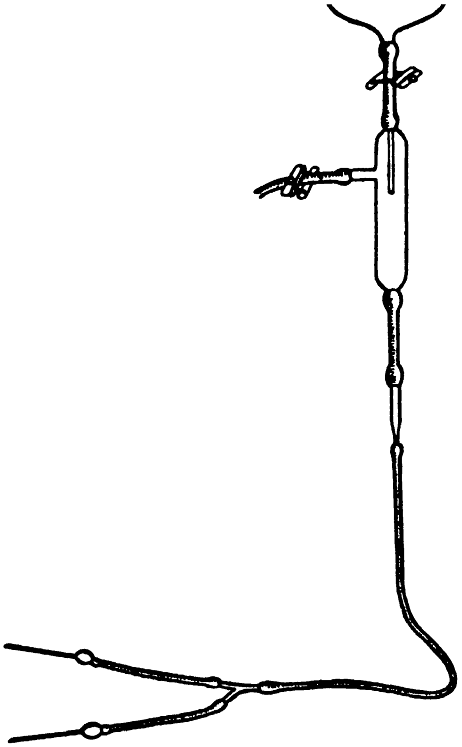

FIG. 13.—Apparatus for subcutaneous infusion.

then released, and the left hand used to steady the abdominal wall. The needle is now pushed through the abdominal muscles and at the same time the saline is slowly injected. It is thus ensured that, at the moment when the point of the needle pierces the peritoneum, the force of the saline stream will displace the bowel and prevent its perforation. When the needle is felt to have entered the peritoneal cavity, the saline is slowly injected. The injection is continued, a syringeful at a time, without withdrawal of the needle, until the flanks of the abdomen begin to show distension. In small infants the usual amount of fluid is about 150 to 250 c.cm.

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# ORTHOPÆDIC SURGERY IN THE TREATMENT OF RHEUMATISM AND RHEUMATOID ARTHRITIS

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THE term rheumatism is a wide one, and is used to discuss the following conditions:—rheumatic fever, myositis, fibrositis, neuritis, rheumatoid arthritis and osteoarthritis. Though there may be a common pathological etiology to these different clinical conditions, as the recent work of Eagles and his co-workers would suggest as having a virus organism as the causative factor, rheumatic fever is not usually included in the term rheumatism. This word is more commonly appended to the other more chronic forms. Probably osteoarthritis should not come under the above headings, but from the point of view of treatment it must be included.

The treatment of myositis, neuritis, and fibrositis comes within the scope of the orthopædic surgeon, but their treatment is mainly given over to his colleague the electro-therapeutist. The orthopædic surgeon should know what means are available for their treatment and the limitations of such treatment. Often a patient spends a great deal of time and money on electrical treatment administered for a condition which only surgical measures could hope to bring relief. Arthritis of the shoulder with pain down the fore-arm has often been treated as a neuritis, the pain not being relieved till the arthritic condition of the shoulder joint is treated. The greatest scope, however, for the orthopædic surgeon is in the treatment of the joint forms of rheumatism.

The treatment of rheumatoid arthritis has made great strides in the last decade. No longer is the deformed cripple an outcast from the big hospital, doomed to a lingering death. Instead throughout the country orthopædic hospitals, and county schemes gather these unfortunate victims together so that the orthopædic team can get to work on them. The team must have the closest co-operation between the physician, surgeon, pathologist and radiologist. In London there are several clinics such as the St. John's Institute of Physical Medicine where such teams of workers exist. The treatment of arthritis is long and tries both the patience and the financial resources of the patient.

Rheumatoid arthritis tends to affect mainly the small joints of the body at first. Later on the knees, elbows, and hips become involved. During the acute stage of the disease nature endeavours to rest the joint, to prevent friction between the inflamed tissues. She does this by muscle spasm. The position assuring the maximum of comfort and capacity of the swollen joints is usually that of flexion. Flexion of the interphalangeal joints of the fingers and wrists gives rise to a completely useless hand. Flexion of the hip produces shortening which will cause a limp. These deformities can be and should be prevented by the following means.

The surgical assistance that the orthopædic surgeon can give to his colleagues comes under the following headings:—the prevention of deformities, the correction of deformities, the restoration of movements, and the relief of pain by operative procedure.

## THE PREVENTION OF DEFORMITIES

*Splinting.*—During the acute stages of the disease, the joints must be kept at rest with some form of splintage. Either a plaster cast or malleable splint should be applied. To the joints themselves applications of lead, belladonna, or iodex relieve the pain. Heat in the form of antiphlogistine or infra-red radiation may be given. Once a day the limb should be taken out of the splint and an endeavour made to put it through some of its range of movement. This may be found too painful but, if it is not, it will tend to prevent adhesions which later will delay recovery. If a position of flexion or adduction of the joint is permitted during this acute stage the muscle, when its protective spasm is over, will be found to have become contracted. The extensors will be weak and stretched. The muscle wasting is great. Both due to reflex trophic disturbances and to disuse.

*Movements.*—When the pain has gone, efforts must be directed towards the correction of any unchecked deformities, and the restoration of movement started. The limb is placed on a hinged splint which can be altered daily in order that the straight position can be gradually acquired. In the case of certain joints it is found by practical experience that certain positions, if the joint becomes stiff, are found to be the most useful to the patient. Briefly these positions are: moderate dorsi-flexion of the wrist, the elbow just above a right angle, the shoulder abducted and slightly forward, the knees and hips slightly flexed.

The making of plaster casts is too expert a procedure to be discussed here, but Messrs. Cellona Ltd., in a booklet issued by them give hints and illustrations about the use of plaster bandages to make these casts. In the case of the large joints, splints that can be hinged are useful. Such splints as that devised by Mr. Timbrell Fisher or by others are invaluable and can be supplied by different instrument makers. During the time that such splintage has been going on the practitioner gives general treatment.

The prevention of deformity in the joints after the acute stage has passed off is carried on at the same time as the restoration of movements again and is dealt on page 275.

### THE CORRECTION OF DEFORMITIES

*Considerations.*—The following points must be considered before the surgeon begins.

(*a*) He must assure himself that the acute stage has passed as shown by absence of temperature, a nearly normal sedimentation rate, and that the joints are no longer hot and swollen.

(*b*) X-ray pictures must be taken of the joints concerned. These will show the amount of destruction of the articular surfaces. It should be remembered that no definite forecast of the degree of movement that is likely to be regained after a proper course of treatment can be forecast by merely looking at the X-ray appearances. Often a joint which shows gross changes may eventually gain a surprising range of painless movement.

The degree of decalcification of the surrounding bones must be noted as, if the bones are seen to be very decalcified, extreme care must be taken against their being fractured in the event of a manipulation being undertaken. X-rays will show whether the disease is of a pure rheumatoid type, or whether osteoarthritic changes have supervened. The presence of osteophytes is indicative of osteoarthritis. Bone ankylosis is rare in rheumatoid arthritis which produces stiffening by peri-articular and intra-articular contractures and adhesions.

(*c*) That as the most painful joints are those with a limited range of movement, it is advisable to start treatment on these joints first.

*Methods employed.*—If a joint preserves a little movement, it will be worth a trial to see if the deformity can be corrected by splintage and physiotherapy. If on the other hand there is no movement, correction by some form of operation must be undertaken.

*Correction by physiotherapy.*—This is carried out on a joint which though deformed still has a little movement, and aims at correcting the deformity and restoring movement. The deformity is corrected by the application of some form of hinged splint or successive applications of plaster of Paris, each application producing a little more correction. If the method of splintage is adopted, a masseuse should apply some form of heat daily to the joint. The joint should be taken out of the splint, massage given, and further stretching done. As the deformity is being corrected, the encouragement of movement is undertaken. This is discussed in the next paragraph.

*Correction by operation.*—This is undertaken on a deformed stiff joint, which is too painful to permit of correction by stretching. Two operative procedures can be employed (i) osteotomy of one of the adjacent bones with the object of correcting the deformity, or (ii) an operation may be undertaken on the joint itself. Arthroplasty will give a mobile, though not very stable, joint, and may be attempted on one of the joints of the upper limb. Arthrodesis will give a stiff joint which will be both stable and painless. It is indicated for a lower limb joint, or one of the arm joints in the working man in whom a stiff joint will provide a better fulcrum for using tools or lifting weights.

### THE RESTORATION OF MOVEMENTS

Provided that the active disease is over, it should be possible, if appropriate treatment be undertaken, to secure a working range of movement to most of the joints which were affected during the acute stage. It is impossible to forecast the degree of recovery of any joint. Though it stands to reason that a joint which was not badly affected will recover best. An X-ray picture will not help in forecasting this restoration of movement and is, as is so often seen in osteoarthritis, very misleading. Often such a joint with much change as shown on the X-ray film will have a surprising range of movement. The restoration of movement will take many months, and the surgeon will often have to be content with a limited range of painless movement.

*Methods employed.*—The restoration of movement in a joint which has had a deformity should not be started upon until about half the normal position of the joint has been secured. For treatment purposes the joint will be taken off the splint. Each day the joint is given a dose of heat, either given in the form of radiant heat, infra-red or diathermy. The muscle wasting which is a prominent feature, is treated by massage and surging faradic current. This is given with a Bristow coil. Active movements are undertaken, gentle at first. These will help the recovery of the muscle power. Later the masseuse moves the joint, putting it through the range of free movement several times. Though more important than this passive movement is the active movement that the patient carries out. It should be the aim of the masseuse to make the patient's own muscles, by their contraction, increase the range of movement. Forced movements by her may do more harm than good. Tearing of tissues, which are still stuck together, by brute force only causes further hæmorrhage and fibrous-tissue formation. It will thus defeat its own end.

When the joints have recovered a fair range of movement, the splints may be gradually left off during the day, but retained as night splints. At this stage the patient after his treatment is encouraged to use his joint, doing certain specified movements so many times after each meal. Thus he continues his own restoration. The masseuse now starts to increase her range of passive movement, though the patient must consolidate each gain by his own power; thus relapse is guarded against. If after some months satisfactory progress is slow, manipulation of the refractory joint may be considered as a means of hastening recovery.

*Manipulation.*—Manipulation is the forcing of a stiff joint under anæsthesia. This may be carried out under gas and oxygen, in the case of the small joints, although a deeper anæsthesia is indicated in the case of the larger joints. After a manipulation it is advisable to start the patient off with active movements the same day. Thus no loss of movement takes place.

The technique of manipulation can only be learnt by watching it done and by practice. Points to be stressed are these: Repeated manipulations on a stiff joint are better than the use of too much force at any one time. The reaction of the joint is likely to be severe if adhesions are broken down too extensively, and, as stated before, further fibrous-tissue formation will ensue causing only worse stiffening. The hands of the manipulator should in most cases, take only a short leverage on the bones. In rheumatoid arthritis there may be much decalcification, and the bones be very brittle. Distraction should be made on the joint as well as leverage, rotation as well as flexion and extension should also be carried out. Tender spots suggest adhesions; if digital pressure be made over them and rotation movements carried out, they can often be heard to give way with a crunch or snap.

Tight tendons when they interfere with movement should be tenotomized, but it may also be advisable to do an open operation and divide the deep tendons and the constricted tight capsule of the joint. Joint movements should be started again as soon as the wound permits.

The correction of joint deformities and the recovery of movement will take months of painstaking work and perseverance both on the part of the masseuse and also the patient. Slow and gentle methods are the best in the long run.

After some six months of treatment, the night splints may be left off, and by this time the patient should have enough muscle power to prevent the recurrence of deformities, though supervision must be maintained. At this stage benefit may follow a visit to a spa where various methods of hydrotherapy are available. Thermal baths, needle douches, mud packs all aid the circulation and render the joints more supple for the masseuse to handle. On return home routine exercises should be done. For the younger patients a dummy row boat serves a useful purpose. Twist grips, pulley weights all aid to keep up the joint movements so dearly regained. If, however, movement is not regained in some of the joints, or if the joints are too painful to hope to do much with the above methods of physiotherapy, it may be wiser to proceed without too long a delay to one of the further operative methods. Excision or a corrective osteotomy may be a less tedious and wiser course to consider. The indications for these procedures are discussed in the next paragraph.

### MAJOR SURGICAL PROCEDURES

If the above methods of physiotherapy have failed to produce improvement in the patient's crippled condition, further surgical aid should be considered. The surgeon has four main operations for the relief of these conditions. A brief discussion of their indications is given below.

*Osteotomy.*—This is used to correct a deformed joint which is very stiff and when restoration of movement is unlikely. It is commonly employed to correct the deformity in a hip or wrist joint. It consists of the division of one of the bones about the joint, and re-setting the limb in the corrected position. A splint or plaster is employed to maintain the position until the bone has united. This takes about three months in the case of the femur, not all of which time need be spent in bed, if plaster and crutches are used.

*Excision.*—This operation is performed when either a joint is very painful or restoration of movement is unlikely, but when it is desirable to secure movement. It is commonly done on the shoulder joint. It consists in removal of the diseased ends of the bone, synovial membrane and other tight structures. Movements are started as soon as convenient. It gives a moderate range of movement, apt to be painful. For stability reasons it is unsuitable for use in the lower limb unless some form of hinged splint be also worn.

*Arthroplasty.*—This operation is merely a refinement of the operation of excision. The rounded ends of the joint bones are preserved, the synovial membrane and other tight structures removed, and a piece of fat, muscle or fibrous tissue is often inserted between the two bone ends. The aim of this operation is to provide a hinged joint and so is most commonly used in the elbow and knee joint. However, the range of movement secured is usually limited and lateral stability poor.

*Arthrodesis.*—This operation consists in the formal removal of the articular cartilage and diseased ends of the bone, with wholesale removal of the synovial membrane and tight structures about the joint. It is an extremely useful operation in that it provides a stable, painless yet stiff joint. It is used when methods of physiotherapy have been found too painful, or when the degree of destruction of the joint is excessive. Often great relief can be secured if one of two knees be arthrodesed, and some degree of movement restored to the other. After the operation, the limb is kept in plaster or other splint until firm union as shown clinically and by X-rays takes place. This usually takes about four to six months. Guarded weight-bearing is an advantage, provided that the joint is held rigid, so that a patient can be soon restored to his feet, a useful point, since some of the patients have already had a long debilitating illness.

# PHRENIC PARALYSIS IN THE TREATMENT OF CERTAIN THORACIC COMPLICATIONS OF SUBDIAPHRAGMATIC INFECTION

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THE relationship of subdiaphragmatic infection (following perforated gastric ulcer or appendicitis, for example) to thoracic complications has been greatly illuminated by studies of the course of the lymphatic vessels in that area. Infection in contact with the under surface of the diaphragm is very liable to extend through it into the thorax, thereby raising important problems of treatment not only of the acute inflammatory lesions, but also of residual troubles which may persist after the acute inflammation has settled down.

The diaphragm is traversed by a rich plexus of lymphatics which drain into lymphatic nodes lying between the superior surface of the diaphragm and the pleura lining it. The lymphatic flow is from below upwards. This has been shown experimentally by means of injection into the abdominal cavity of Indian ink; if the experimental animal is made to struggle, so massaging its abdominal contents, particles of Indian ink can be seen a few minutes afterwards, staining the thoracic surface of the diaphragm. On the other hand, the diaphragm forms a very efficient barrier to extension of infection from the thorax to the abdomen; Beye (1932) noted that in a series of 337 cases of thoracic empyema, there was only one instance of extension of infection into the abdomen, and that was clearly due to injury of the diaphragm during operation for drainage of the empyema.

The earliest manifestation of thoracic complications of a subphrenic infection is usually a plastic pleuritis. In this way, the under-surface of the lower lobe of the lung is fixed to the diaphragm. If the infection is more intense, especially if it affects a wide area under the diaphragm, there may be a rapid spread through the lymphatics to a considerable area of the pleura, with the development of a pleuritic effusion. This effusion may be serous and sterile, or it may contain organisms. An empyema may thus form, and remain localized and encysted, or it may be more widespread and track to the thoracic wall; it may even develop after the subphrenic infection has settled down either naturally or after surgical drainage. After surgical drainage of a subphrenic abscess, fibrinous adhesions formed in the thorax may be broken down when the diaphragm descends again to its normal position. If the empyema is encysted in plastic pleuritic exudate, the infection may invade the lung, and produce either pneumonitis or lung abscess; the pus may find its way into a bronchus, whence it may be coughed up. In long-standing cases, there may be actual necrosis of diaphragmatic tissue, with perforation of the diaphragm, and an hour-glass type of abscess above and below the diaphragm.

Effective treatment will therefore involve a careful estimate of the pathological picture—of what has happened during the stage of active inflammation, and also what is likely to happen as the result of the processes of recovery and repair. A case is here reported in which the crippling effect of scarring following a subphrenic inflammation was dealt with by crushing the phrenic nerve and so paralysing one half of the diaphragm.

## CASE REPORT

A woman of thirty years of age was operated upon in December, 1936, for a perforated, gangrenous appendix, with peritonitis. After the operation, she was confined to bed for a month, but though the wound drained well and finally healed, she never became really well. In February, she was sent to the sea coast to convalesce; she still had much nausea, and frequent drenching sweats which awakened her in the night. She had also developed a pain in the back and the right side in the region of the lower ribs; it was aching and spasmodic, and it radiated to the right shoulder.

There was never at any time any degree of jaundice, and when seen first, at the end of May, her fingers were not clubbed. While at Eastbourne, she developed a cough, and later she began to bring up sputum containing blood and pus, unpleasant to smell and with a sweetish taste. By April, the sputum was copious, and the drenching sweats had gradually diminished. No record is available of what the temperature was following the operation; the chest had been explored with a needle, but no pus found. Towards the end of May, she was admitted to a private ward of the Liverpool Royal Infirmary, for observation and re-investigation. She told us that she had lost over three stones in weight since her operation, and her main complaint was the pain in the right side, which was " wearing her out." It was still present in the region of the lower ribs, but it no longer radiated to the right shoulder. When she lay on her left side, however, she felt an unpleasant " dragging," with exacerbation of the pain. Her temperature was normal, save for an occasional rise to 99° F. The sputum was not so copious as it had been, and she now had to cough vigorously to get it up; it was still foul and blood-stained. Clinical examination revealed nothing abnormal in the abdomen; at the base of the right lung there was diminished expansion, dullness to percussion and poor air entry. The heart was slightly displaced to the right side.

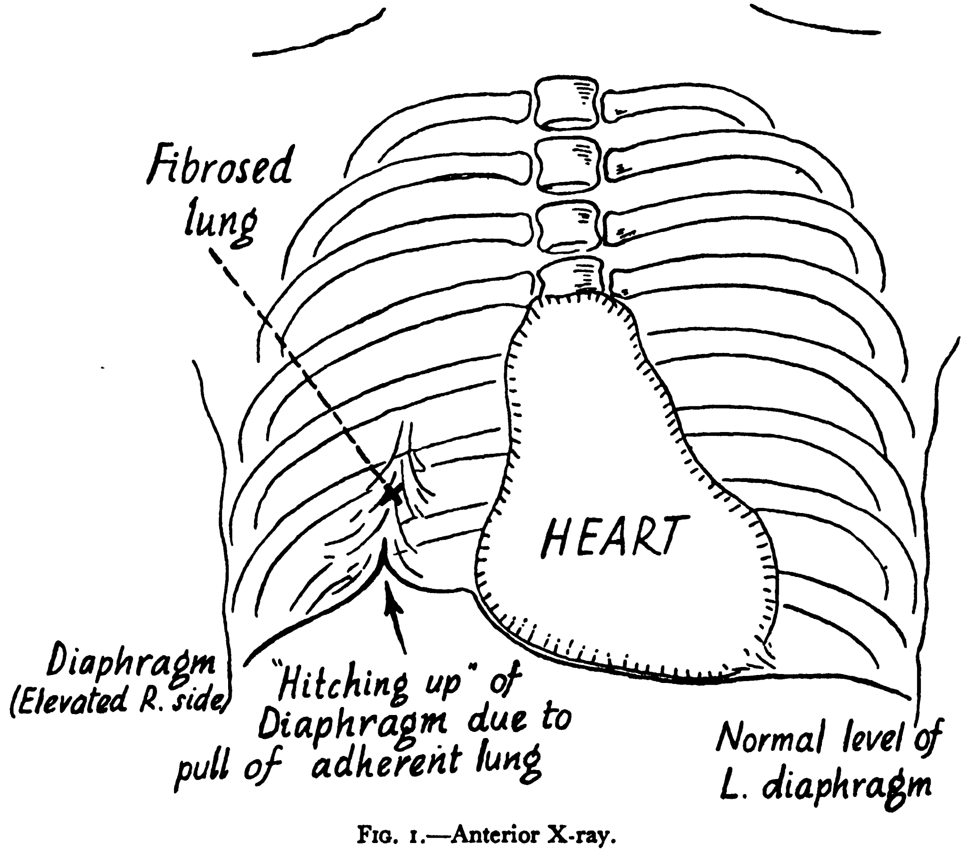
Fibrosed lung
HEART
Diaphragm (Elevated R. side)
"Hitching up" of Diaphragm due to pull of adherent lung
Normal level of L. diaphragm

FIG. 1.—Anterior X-ray.

X-ray examination by Dr. R. E. Roberts revealed a marked elevation of the dome of the diaphragm, with restricted movement and thickening of the diaphragmatic, interlobar and peripheral pleura, on the right side.

Lipiodol injection detected no evidence of bronchiectasis; with the elevation of the diaphragm, there was a marked crowding together of the lower bronchi, and the lipiodol did not enter the right middle zone, " possibly owing to kinking of the bronchus supplying this area." Bronchoscopy revealed no obvious deformity or abnormality of the main right bronchus or accessory bronchi; and exploratory puncture of the pleural cavity was negative. There was a leucocytosis of 18,500 with a preponderance of polymorphonuclear cells (90 per cent.).

It seems likely therefore that after the appendix operation she developed a localized subdiaphragmatic abscess, with compression of and subsequent infection at the base of the right lung (Fig. 1). Adhesions had localized the pleural lesion and prevented the formation of any appreciable empyema. Finally she had begun to cough up the contents of the abscess through the lung, and by the time she was first seen she was well on the way to a natural recovery from that particular disability, although the leucocytosis and the character of the sputum indicated that it was not yet fully evacuated. It seemed wise to trust now to a natural cure rather than to an awkward and perhaps serious local surgical exploration. The persistent pain in the right side, however, called for relief, if it could possibly be given; now, surely it must be largely due to tension of adhesions about the affected area, involving diaphragm, pleura and lung? A lateral X-ray view of the thorax showed clearly that the diaphragm was actually " hitched up " at one point (Fig. 2 and 3). Moreover it was likely that the local damage to the lung, combined with the pull of gradually contracting scar tissue on it, would result later in the development of bronchiectatic dilatation.

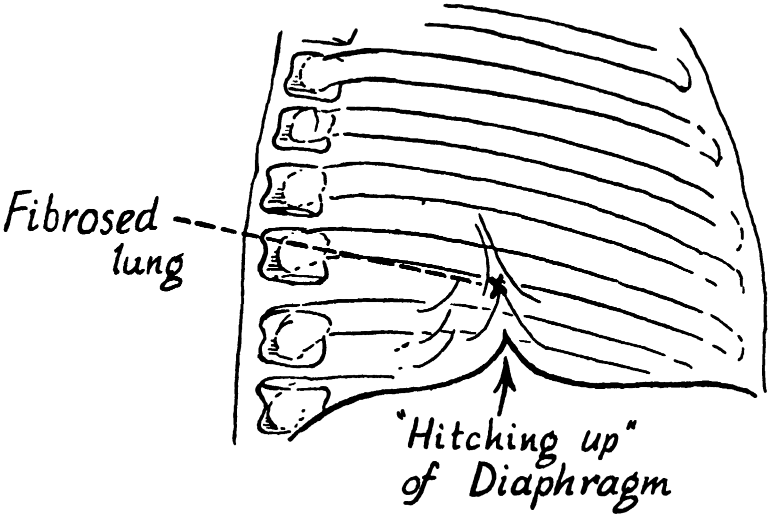

FIG. 2.—Lateral X-ray.

For these reasons, it was decided that it was proper to relax the local tension by paralysing the right side of the diaphragm. On June 6, 1937, the right phrenic nerve was crushed under local anæsthesia, in order to produce a *temporary* paralysis of the right side of the diaphragm—a step which gives the opportunity of reviewing the patient's condition after the lapse of some months.

Immediately after the operation, indeed while she was still on the table, she announced the disappearance of the pain. A few days later, she was discharged from hospital with a view to a long and careful convalescence. Her doctor reports that she has already picked up considerably, " largely due to freedom from pain," and that she is no longer coughing up blood in the sputum. This temporary paralysis of the diaphragm may enable the lower portion of the damaged right lung so to recover that it may not be necessary to establish a permanent phrenic paralysis. This problem can be considered later, however, when the local inflammation has completely resolved, and when some estimate can be made of the extent and effect of the scarring present in that area.

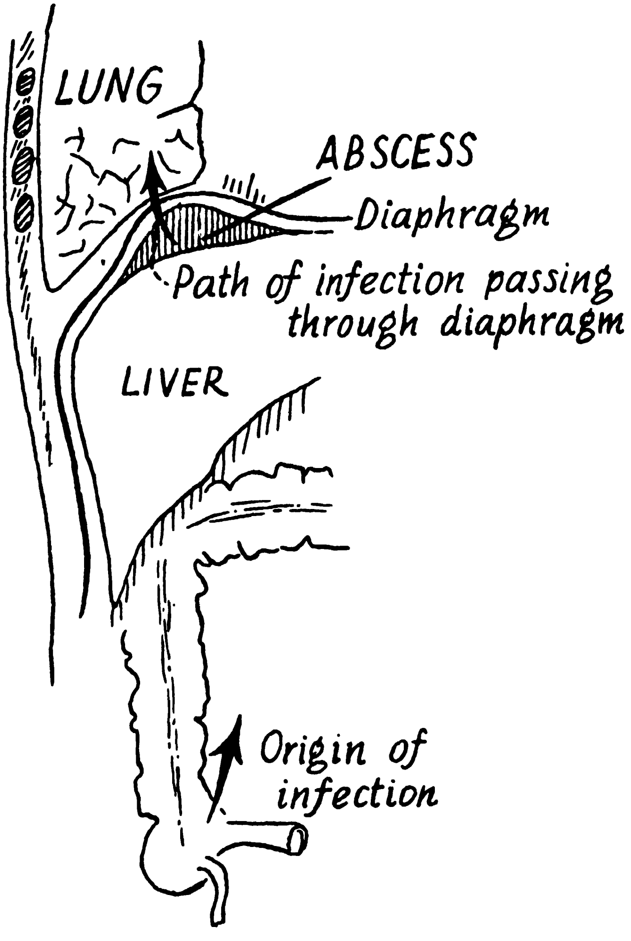

FIG. 3.—Diagram of path of infection.

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# URINARY DISEASE ASSOCIATED WITH NERVOUS DISEASE

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THIS article deals with the urinary lesions which accompany nervous diseases and injuries. It is founded upon notes which have been made of the post-mortem records for twenty years at Guy's Hospital, and two years' similar notes at the London Hospital, and upon clinical experience for twenty-six years at Guy's Hospital.

Urinary lesions associated with nervous disease or injury may be a result of such nervous lesions, or may be simply associated with them apparently as a coincidence, but in some of them the urinary lesion may have given rise to the lesion of the central nervous system or its nerves. Thus tabes may be followed by a urinary infection, but this disease may be associated with an enlarged prostate as a coincidence, and in one case of peripheral neuritis the result of treatment showed that the cause of the nervous disease lay in the formation of stones in the prostate.

The following points seem to emerge from a perusal of the post-mortem records, and may be tabulated quite shortly. Readers will appreciate that the subject is considered from the urinary point of view.

Marcus Beck long ago showed that ascending nephritis was lymphatic in progress, and these views have been emphasized recently by Kenneth Walker, and those with a large clinical experience know that the observations are true. No doubt there are catarrhal changes in the ureters and pelves of the kidneys, but these may be regarded as end-results. The lymphatics of the urethra run via the base of the bladder-wall, and thence to the connective tissue of the wall of the ureters, and so to the capsules of the kidneys and thence to the connective tissue of these organs. Thus ascending nephritis is an acute septic interstitial nephritis, and during its progress perinephritis of a septic nature may occur with abscess formation occurring at any point in the course of the lymphatic paths. Pelvic abscesses may occur without any previous damage to the bladder or prostate, and suppurative perinephritis may occur as a result of ascending inflammation. Thomson-Walker's observations in connection with urinary infections associated with nervous injuries are well known, but in this article the pathology and prognosis of urinary infections will be noted.

### GENERAL CONSIDERATIONS

The urinary infections due to nervous disease or injury result in an ascending nephritis, the inflammation spreading along lymphatic paths. Ascending nephritis is usually bilateral, but it may be unilateral, and in a few cases compensatory hypertrophy may occur in the unaffected kidney. Thus when even the kidneys are infected the prognosis is by no means hopeless. For example, an elderly adult with tabes, who developed an ascending nephritis, was subjected to treatment and lived for three years after he came under this form of attention. In a few cases it would appear that congestion of the kidneys preceded infection of the lower urinary tract, as was suggested by the necropsy of one case. Nor must it be assumed that hæmaturia is necessarily associated with progressive inflammatory changes; for example, in one post-mortem case the lesion was an acute nephritis which may be considered as a coincidence. Moreover, a case of enlarged prostate was associated with tabes, and the bleeding which occurred undoubtedly arose in the prostate. The inflammation which may occur in the bladder does not in any way throw light on the state of the kidneys, for there may be well-marked cystitis, with healthy kidneys, and conversely there may be inflammation and suppuration of the kidneys, in cases in which the bladder does not show more than a few points of vascular injection.

It should never be forgotten that nervous lesions may be a predisposing cause of sepsis. It may be stated, without detailed evidence, that as a fair number of patients may have had syphilis and gonorrhœa, tabes may be associated with a stricture of the urethra. If this condition is not recognized much unnecessary difficulty may ensue when an attempt to pass a catheter is made, and thus infection may be all the more easily induced. The prepuce may be contracted and septic, and if it is damaged ascending nephritis becomes almost a certainty. An enlarged prostate may be easily damaged by careless catheterization, and certainly its presence favours injury from the passage of an instrument. Intercurrent complaints should always be suspected in these cases and their diagnosis made or excluded before the passage of any instrument is undertaken.

### BLADDER DISABILITY

What is the actual disability of the bladder in nervous lesions? The question must not be answered as loosely as some of my notes imply. A "paralyzed bladder" is not an exact description of the condition that is present. What is wanted is a plain statement about the nature of the state of the bladder. "Incontinence" is a loose phrase, for it may indicate either that the bladder is so distended that there is overflow of the urine, or that it is contracted so that every drop of urine as it comes from the kidneys is discharged, without any vesical control, through the urethra. The distinction is important, for with incontinence of the latter type instrumentation is obviously quite unnecessary, and thus one source of infection of the bladder and kidneys may be avoided. I have never laid much stress upon percussion in the bladder region for signs of its distension, as the question of a dull or a resonant note depends entirely upon whether the bladder is distended in front of the bowels or behind them. When examining a case of nervous disease with urinary symptoms the prepuce and urinary meatus should always be examined first, and then the region of the bladder should be palpated. Even when the bladder cannot be felt as a definite swelling an experienced practitioner can generally recognize that it is distended, and in a case of tabes with retention of urine the practitioner must not be led astray by the overflow which may accompany it.

A patient was thought to have an enlarged prostate, with marked retention and overflow, the prostate was not very obviously enlarged but a certain inco-ordination of gait, Argyll Robertson pupils, and absent knee-jerks led to the diagnosis of tabes. The bladder was evacuated under strict antiseptic precautions, and large doses of strychnine given, and the necessity of constantly passing an instrument was thus avoided. The man lived for at least eight years more.

I am convinced that it is more important to pass an instrument without damage to the urethra and adjacent parts than to pass it under antiseptic precautions. Septic organisms may be present without ascending infection, but there cannot be trauma without the introduction of infection. The gentle hand in these cases is more important than the scrupulously clean one. This is the main reason for the recommendation that care should always be taken to exclude lesions such as stricture, a contracted prepuce, and an enlarge prostate before an attempt is made to pass an instrument. An enlarged prostate should be diagnosed by a rectal examination, and not by the urethral route. If a urethral examination is made it must be by the passage of a small coudé catheter very gently. The hand must be guided so to speak by the instrument, and should never be used to force the instrument along a passage through which it does not mean to go. In this connection the surgeon should be prepared to allow the instrument to rotate longitudinally in his hand, when it shows a tendency to do so. This is a most useful piece of practical information in these cases.

## THE TREATMENT OF INCONTINENCE

If there is little inconvenience caused by either the incontinence of a small bladder or the overflow from a large and distended one, there does not appear to be any need for the passage of an instrument. The penis should be covered with cyanide gauze, and over this a layer of compressed Iceland moss is most useful for absorbing the escaping urine. The scrotum and testes should always be supported adequately, and even brought up on to the surface of the abdomen. Urinary antiseptics may be administered by the mouth, or may be injected into the blood-stream; an instrument must be avoided at all costs, but if this becomes necessary it should be passed with the following precautions: it should never be retained, but if needed passed twice a day;

the instrument must not be a large one, but no. 7 English size is sufficient to drain the bladder moderately slowly, without damaging the urethra by its size. As a rule it should be coudé in shape. I object to india-rubber instruments for passage into the urethra; india-rubber, as a rule, contains free sulphur which cannot be considered as safe from doing harm. Moreover, such a catheter under a certain size cannot be passed, and the lumen of the tube is not sufficiently large to give adequate drainage when the instrument is of less than a certain size. Whilst the bladder is being drained the catheter should be covered with cyanide gauze, and care should be taken that it does not come into direct contact with the skin of the thigh or the scrotum or abdomen. It should be removed with the same caution as was used when it was introduced.

If it is decided that on the whole the bladder should be opened owing to unavoidable damage to the urethra, on no account should a perineal drainage be resorted to, as such an operation is almost certain to be accompanied by sepsis sooner or later; a suprapubic opening of the bladder should be done. Even if this becomes septic the lymphatics which drain the wound do not run direct to the kidney as they do in connection with a perineal and urethral wound, or a wound of the base of the bladder. And it should be remembered that the bladder may show few or no signs of inflammation, but nevertheless the infection may pass direct to the kidneys.

## ILLUSTRATIVE CASES

Two illustrative cases which occurred at the same time at Guy's Hospital in the genito-urinary department may be quoted.

TABES WITH CYSTITIS.—Both were males suffering from tabes, and in both the symptoms of this disease began with retention of urine, and later sepsis of the bladder. They both lived for five years after the onset of cystitis which was accompanied by masses of thick pus in the urine, and in one case a fæcal smell characterized the urine. A catheter was passed in each case with the precautions mentioned above, and the bladder was instilled and irrigated with oxycyanide of mercury (1 in 4,000). Salvarsan or one of its derivatives was also administered. For this form of treatment the patients were both admitted to the hospital at the same time. In both of these cases a moderate-sized catheter was passed only when its use seemed to be indicated, and on one of the patients this was necessary about every six weeks. In the other two months interval seemed to relieve the patient. One of the patients died without my seeing him, but I saw the other right up to his death, which occurred owing to ulcerative colitis doubtless following upon an ascending nephritis. It is important to note that the chief symptoms in both these patients were connected with the bladder; one was precluded from doing any work, but the other performed arduous duties as a clerk in the Stock Exchange almost up to the time of his death.

TABES WITH NEPHRITIS.—A patient consulted me for what was diagnosed by a competent physician as definitely nephritis of a septic nature. He had a small instrument passed and the bladder was emptied, and irrigated, and urinary antiseptics administered by the mouth. He lived for three years after this.

## STRICTURE

Stricture has been mentioned as a coincidence in certain cases of nervous disease, but some authorities have made it occupy a more important position, and some French writers, before the war stated that tabes was due to stricture. This view is not supported by my observations. I had two patients with combined stricture and tabes both with lightning body-pains due to tabes. Dilatation of the stricture in each case relieved the lightning pains, but otherwise the disease continued to progress. Every urinary surgeon is familiar with cases of stricture in which pains in the back are experienced. Moreover the fact of the deterioration of the general health is well known in cases of stricture of the urethra. Dilatation of the stricture may do good on both these counts. The back pains may be eliminated, and the general health be much improved, and the progress of the nervous disease be retarded.

## PERIPHERAL NEURITIS

The consideration of a case of peripheral neuritis may be usefully considered now.

A man aged about sixty-five was seen by Dr. Charles Symonds who diagnosed peripheral neuritis, and thought that the presence of prostatic calculi might be a probable cause of the nervous disease. I have shown (1929) that prostatic calculi have a septic origin, and acting on Dr. Symonds' diagnosis, I removed the calculi from the prostate, and quite deliberately left the prostate *in situ*, though thoroughly cleared of its stones. The bladder was adequately drained for some time after the operation, and the patient quickly lost his peripheral neuritis. He was known to be well and free from neuritis three years after the operation, and the prostate caused him no further trouble.

## SUMMARY

Ascending nephritis is lymphatic in progress. Damage must not be done in the passage of an instrument along the urethra and past the prostate, and careful antiseptic precautions must be taken to prevent spreading inflammation. Ascending nephritis may be unilateral, and compensatory hypertrophy may take place in the sound kidney. When ascending nephritis has occurred, hope may still be held out on these grounds, and careful treatment directed towards the urinary condition continued. Catheters should not be retained in the bladder, but passed as needed without damage. Cyanide gauze should be used to cover the catheter while in use, and to prevent the catheter coming into contact with the skin, and the scrotum must be raised if possible on to the abdominal wall. If the bladder demands incision then a suprapubic opening should be made. Cases of tabes which manifest urinary symptoms are by no means at the end of their tether, and have lived for years with careful attention to catheterization under non-traumatic, and antiseptic conditions. A case of peripheral neuritis has been quoted which with the great help of Dr. Charles Symonds, yielded excellent results after prostatic stones had been removed. Cases of tabes in which lightning pains disappeared with suitable treatment directed to the cure of a concomitant stricture, have been offered.

It is correct to assert that urinary symptoms may be the first of which a tabetic complains. Cystitis may in fact have developed, but in spite of this, treatment in certain cases is well worth the trouble it causes.

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# DIET IN HEALTH AND DISEASE

## III.—DISPENSING SPECIAL DIETS

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NOW that the dietary department has become an integral part of many hospitals, and is included in the building plans of many others, it may be of interest to describe its work. This is usually divided between in- and out-patients—the dietitian and her staff carrying out the physician's prescriptions for the former, and teaching the latter to carry these out themselves at home. The dietitian must be a good cook in order to convert the prescription of, say, carbohydrate, protein, and fat into palatable and attractively served meals, as well as in order to teach patients how to cook their diets themselves. She must also have a sound knowledge of dietetics and of chemistry and physiology up to B.Sc. or 2nd M.B. standard in order to be able to fulfil dietary prescriptions intelligently and to make her own contributions to their practical application, or in planning such research diets as, for instance, those for calcium metabolism. In the training of a dietitian theoretical work is followed by six months in a hospital diet kitchen, and usually some weeks in a main kitchen. Most hospitals do not regard nursing training as essential, but it is the greatest advantage to a dietitian, and in some hospitals student dietitians during their training, if they are not nurses, obtain experience in the wards. In all cases dietitians work strictly under the medical attendant's orders, and although they may make suggestions on the details of diets, they can do nothing without a prescription, quantitative or qualitative as the case may be. Quantitative prescriptions are calculated according to food tables and the recent Medical Research Council analyses* have made it possible to calculate diets according to the results of modern analytical technique applied to typical raw and cooked English foods. Diabetic diets without insulin are usually arranged so that the carbohydrate is evenly distributed between the meals; when insulin is given, the larger amount of carbohydrate is given after the dose or doses. If protamine retard insulin or protamine zinc is used, the arrangement of carbohydrate is in each case made by the physician, since the maximum action of these new insulins is considerably deferred and patients must be treated individually.

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* McCance and Shipp, "Chemistry of Flesh Foods and their Losses on Cooking," 1933. McCance, Widdowson and Shackleton, "The Nutritive Value of Fruits, Vegetables and Nuts," 1936.

In a diet kitchen, to prevent risk of mistakes when large numbers of diets are served it is usually found most convenient to label every weighed portion with its weight, and the name or bed number of the patient, and his ward or room. When only qualitative restrictions are necessary, the dish should be marked "low fat", "low salt", or the like. At St. Bartholomew's Hospital as a further precaution food for diabetics is always served in a different coloured dish from that used for sugared or other foods suitable for non-diabetic diets. The foods making up the prescription for a diabetic may have to be considerably modified according to the condition of the patient. Should he have influenza, or be recovering from an operation for instance, a fluid diet may be all he can take at first, whilst the times of insulin, if he takes it, and the amount of carbohydrate must not be varied from the usual quantities. Examples of normal, light and fluid diets containing 150 grammes carbohydrate for use with insulin are given below (see pp. 294–95). In cases of indigestion the type of food used and the hours of feeds must be modified as indicated. The bulk and cellulose of the diet will have to be reduced, cabbage and lettuce omitted altogether, and stewed or baked apple or orange juice substituted for the usual portions of fruit according to their carbohydrate value. This diet should suit a patient with heart disease as he also needs an easily digested diet of small bulk so as to avoid pressure of the stomach on the heart. It may be wise in this case to reduce the breakfast by about 10 grammes carbohydrate, say ⅔ oz. of bread, in order to give in the middle of the morning 2 oz.

grapes, ½ oz. of unsweetened biscuits, or 7 oz. of milk, so that the heart muscle may (then) have readily available carbohydrate.

When extra exercise, games for instance, is occasionally taken by a diabetic within a few hours of a dose of insulin, the extra 15 grammes carbohydrate can be taken in the form of 7 oz. milk and ½ oz. of unsweetened biscuit, or 6 oz. of peeled orange.

A child's diet must contain larger amounts of calcium than an adult's if growth is to be normal, and therefore it is usual to include a pint to a pint and a half of milk in a diabetic child's diet up to, at any rate, the age of sixteen. If a child requires a low-fat diet because of jaundice or cyclical vomiting, care must be taken to give him 1½ pints skimmed milk, and also some vitamin A and D concentrate to compensate for the deficiencies inevitable in the diet. The dietitian should be sure to arrange diets for children who require them so that they feel as little as possible handicapped amongst their fellows. There is no reason, for instance, why a diabetic child should not have his third of a pint of milk at school calculated as part of his diet, so that he can take it through a straw with his class mates. Whilst he cannot have ordinary cakes and sweets, the possibility of an "inferiority complex" may be avoided by early making him feel that he is a person with special knowledge of how to keep fit which he shares with tennis players, swimmers, footballers, and other athletes whom boys and girls usually admire.

### HIGH CALORIE—LOW RESIDUE DIET

A new adaptation of an old diet is the high calorie, low residue type now used for streptococcal infections treated with prontosil or similar drugs. Sulphur is often forbidden in this case, and eggs have therefore to be avoided. A high calorie fluid diet for this disease might consist of two-hourly feeds of milk and cream mixtures with various flavourings alternating with strained raw and cooked fruit juices well sweetened with glucose or lactose to increase the calories, and jellies, junkets, ice creams, or cream or milk soups.

## DIABETIC DIETS CONTAINING

### *Insulin before Breakfast*

| | Gm. | Oz. | Normal Diet. | C. Gm. | P. Gm. | F. Gm. | Gm. | Oz. | Diet for Indigestion. | C. Gm. | P. Gm. | F. Gm. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Breakfast | | | One egg | | 6·4 | 4·0 | | | One egg, boiled or poached | | 6·4 | 4·0 |
| | 30 | 1 | Bacon, raw weight | | 3·6 | 15·3 | 60 | 2 | Bread, white | 30·0 | 4·8 | 0·6 |
| | 60 | 2 | Tomato | 1·6 | 0·6 | | 60 | 2 | Milk in weak tea | 2·8 | 2·0 | 2·2 |
| | 90 | 3 | Bread | 45·0 | 7·2 | 0·9 | | | | | | |
| | 100 | 3½ | Milk in tea or coffee | 5·0 | 3·5 | 3·9 | | | | | | |
| Mid-Morning | | | | | | | 30 | 1 | Bread, white | 15·0 | 2·4 | 0·3 |
| | | | | | | | 100 | 3½ | Warm milk | 5·0 | 3·5 | 3·9 |
| *Carbohydrate at breakfast and Mid-morning* | | | | 51·6 | | | | | | 52·8 | | |
| Dinner | 60 | 2 | Meat | | 15·0 | 12·2 | 45 | 1½ | Chicken, rabbit, and sweetbreads | | 11·8 | 4·6 |
| | | | Cabbage or other vegetable containing negligible carbohydrate, as much as desired | 1·0 | 0·6 | | | | Cauliflower or sieved spinach, small portion | 1·0 | 1·3 | |
| | 120 | 4 | Potatoes | 20·0 | 2·4 | | 90 | 3 | Mashed potato | 15·0 | 1·8 | |
| | 100 | 3½ | Milk as custard or junket or in coffee | 5·0 | 3·5 | 3·9 | 180 | 6 | Baked apple (weighed before cooking) | 15·0 | 0·6 | |
| | 120 | 4 | Apple or other fruit containing 10 Gm.C. | 10·0 | 0·4 | | 100 | 3½ | Milk as custard of junket | 5·0 | 3·5 | 3·9 |
| *Carbohydrate at dinner* | | | | 36·0 | | | | | | 36·0 | | |
| Tea | 22 | ¾ | Cheese or one egg | | 6·4 | 4·0 | 22 | ¾ | Fresh milk or cream cheese or one egg | | 6·4 | 4·0 |
| | 15 | ½ | Bread | 7·5 | 1·2 | 0·2 | 15 | ½ | Bread, white | 7·5 | 1·2 | 0·2 |
| | 60 | 2 | Tomato (green salad if desired) | 1·6 | 0·6 | | 60 | 2 | Milk in weak tea | 2·8 | 2·0 | 2·2 |
| | 60 | 2 | Milk | 2·8 | 2·0 | 2·2 | | | | | | |
| *Carbohydrate at tea* | | | | 11·9 | | | | | | 10·3 | | |
| Supper | 45 | 1½ | Ham or 2 oz. meat | | 15·0 | 12·2 | 75 | 2½ | Steamed fish | | 13·5 | 0·6 |
| | 75 | 2½ | Bread (or ½ oz. bread and 6 ozs. potatoes) | 37·5 | 6·0 | 0·8 | 90 | 3 | Mashed potato or 1 oz. white bread | 15·0 | 1·8 | |
| | 120 | 4 | Orange or other fruit containing 10 Gm.C. | 10·0 | 0·8 | | 100 | 3½ | Milk pudding | 5·0 | 3·5 | 3·9 |
| | 60 | 2 | Milk in tea or coffee | 2·8 | 2·0 | 2·2 | 9 | ⅓ | Rice or tapioca pudding | 8·2 | 0·6 | |
| Bed-time | | | | | | | 5 | 3½ | Unsweetened bisuits | 10·0 | 1·7 | 1·6 |
| | | | | | | | 7 | ¼ | Bournvita or ovaltine | 5·0 | 0·9 | 0·6 |
| | | | | | | | 15 | 5½ | Milk | 7·0 | 5·0 | 5·5 |
| *Carbohydrate at supper and bedtime* | | | | 50·3 | | | | | | 50·2 | | |
| | 45 | 1½ | Butter all day | | 0·2 | 36·3 | 45 | 1½ | Butter all day | | 0·2 | 36·3 |
| | | | | 149·8 | 77·4 | 98·1 | | | | 149·3 | 74·9 | 74·4 |

Diets adapted from Abrahams & Widdowson " Modern Dietary Treatment "; by kind

## 150 GRAMMES CARBOHYDRATE

*and Supper.*

| Gm. | Oz. | Light Diet. | C. Gm. | Gm. | Oz. | Fluid Diet. | C. Gm. | Gm. | Oz. | Child's Diet. | C. Gm. | P. Gm. | F. Gm. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | One egg, boiled or poached - - | | 15 | ½ | Bournvita or ovaltine- | 10·0 | | | One egg - - - | | 6·4 | 4·0 |
| | | | | 150 | 5 | Milk - - - | 7·0 | 52 | 1¾ | Bread - - - | 26·3 | 4·2 | 0·5 |
| 30 | 1 | Bread - - - | 15·0 | 15 | ½ | Glucose or Lactose - | 15·0 | 15 | ½ | Porridge, raw weight or breakfast cereal | 10·0 | 1·9 | 1·1 |
| 20 | ⅔ | Marmalade - - | 13·0 | | | | | | | | | | |
| 60 | 2 | Milk in weak tea - | 2·8 | | | | | | | | | | |
| 150 | 5 | Milk - - - | 7·0 | 20 | ⅔ | Lemonade<br>Glucose } - - | 20·0 | 100 | 3½ | Milk - - - | 5·0 | 3·5 | 3·9 |
| 15 | ½ | Bournvita or ovaltine- | 10·0 | | | | | 200 | 7 | Milk (third of a pint) | 10·0 | 7·0 | 7·7 |
| 5 | ⅙ | Glucose - - - | 5·0 | | | | | | | | | | |
| | | | 52·8 | | | | 52·0 | | | | 51·3 | | |
| 90 | 3 | Fish if desired - - | | 150 | 5 | Milk as junket or jelly | 7·0 | 60 | 2 | Meat - - - | | 15·0 | 12·2 |
| 9 | ⅓ | Rice or tapioca pudding - - - | 8·2 | 7 | ¼ | Glucose - - - | 7·0 | | | Cabbage or other vegetable containing negligible carbohydrate, as much as desired - | 1·0 | 0·6 | |
| 120 | 4 | Milk pudding - - | 5·6 | 22 | ¾ | Lemonade<br>Glucose } - - | 22·0 | | | | | | |
| 7 | ¼ | Glucose - - - | 7·0 | | | | | | | | | | |
| 90 | 3 | Stewed prunes or mashed potato - | 15·0 | | | | | 90 | 3 | Potatoes - - - | 15·0 | 1·8 | |
| | | | | | | | | 120 | 4 | Apple or other fruit containing 10 Gm.C. | 10·0 | 0·4 | |
| | | | | | | | | 200 | 7 | Milk as junket or jelly or to drink - - | 10·0 | 7·0 | 7·7 |
| | | | 35·8 | | | | 36·0 | | | | 36·0 | | |
| 15 | ½ | Bread - - | 7·5 | 7 | ¼ | Glucose - - - | 7·0 | 15 | ½ | Bread - - - | 7·5 | 1·2 | 0·2 |
| 60 | 2 | Milk in tea - - | 2·8 | 60 | 2 | Milk in tea - - | 2·8 | 60 | 2 | Milk in weak tea (or 1 oz. orange juice in water) - - | 2·8 | 2·0 | 2·2 |
| | | | 10·3 | | | | 9·8 | | | | 10·3 | | |
| | | One egg boiled, or poached if desired | | 15 | ½ | Lemonade<br>Glucose<br>One egg } - - | 15·0 | 45 | 1½ | Cream cheese or two eggs - - - | | 12·8 | 8·0 |
| 150<br>50 | 5<br>1¾ | Milk<br>Bread { as bread and milk if desired | 7·0<br>25·0 | 150 | 5 | Milk - - - | 7·0 | 60 | 2 | Bread - - - | 30·0 | 4·8 | 0·6 |
| | | | | 10 | ⅓ | Glucose<br>Boiled custard or ice cream } | 10·0 | | | Cress or lettuce, as desired | | | |
| | | | | | | | | 120 | 4 | Orange or other fruit containing 10 Gm.C. | 10·0 | 0·8 | |
| | | | | | | | | 240 | 8 | Milk - - - | 11·2 | 8·0 | 8·8 |
| 15 | ½ | Bournvita or ovaltine- | 10·0 | 15 | ½ | Bournvita or ovaltine- | 10·0 | | | | | | |
| 120 | 4 | Milk - - - | 5·6 | 120 | 4 | Milk - - - | 5·6 | | | | | | |
| 5 | ⅙ | Glucose - - - | 5·0 | 5 | ⅙ | Glucose - - - | 5·0 | | | | | | |
| | | | 52·6 | | | | 52·6 | | | | 51·2 | | |
| | | | | | | | | 30 | 1 | Butter all day - - | | 0·1 | 24·2 |
| | | | 151·5 | | | | 150·4 | | | | 148·8 | 77·5 | 81·1 |

permission of Messrs. Baillière, Tindall & Cox.

## HIGH CALORIE-LOW RESIDUE DIET

### (Low Sulphur)

| Meal. | Gm. | oz. | | Calories. |
|---|---|---|---|---|
| Breakfast | 15 | ½ | Conflakes, rice crispies, puffed rice, or patent barley. | 56 |
| | 30 | 1 | Cream | 131 |
| | 150 | 5 | Milk in tea or coffee, and with cereal | 100 |
| | 30 | 1 | Glucose in tea or coffee, and with cereal. | 116 |
| | 45 | 1½ | Bread, white | 114 |
| | 10 | ⅓ | Butter | 75 |
| | 30 | 1 | Jelly or honey | 111 |
| Mid-morning | 30 | 1 | Lemon juice, well strained } | 232 |
| | 60 | 2 | Glucose—water to taste } | |
| | 30 | 1 | Cake, plain | 130 |
| Dinner | 45 | 1½ | Chicken or rabbit | 81 |
| | 120 | 4 | Mashed potato | 100 |
| | 15 | ½ | Butter | 113 |
| | 10 | ⅓ | Rice or tapioca } | 36 |
| | 120 | 4 | Milk } Milk pudding | 80 |
| | 10 | ⅓ | Glucose } | 41 |
| | 90 | 3 | Milk in coffee or tomato soup | 60 |
| | 30 | 1 | Cream on pudding, and in coffee or tomato soup. | 131 |
| | 45 | 1½ | Chocolate | 216 |
| Tea | 60 | 2 | Bread, white | 152 |
| | 15 | ½ | Butter | 113 |
| | 30 | 1 | Honey or jelly | 111 |
| | 60 | 2 | Milk in tea | 40 |
| | 15 | ½ | Glucose in tea | 58 |
| Supper | 90 | 3 | Steamed haddock | 84 |
| | 15 | ½ | Butter | 113 |
| | 90 | 3 | Mashed potato or 1 oz. bread | 75 |
| | 10 | ⅓ | Butter | 75 |
| | 150 | 5 | Milk as junket or jelly | 100 |
| | 10 | ⅓ | Glucose or lactose | 41 |
| | 30 | 1 | Cream | 131 |
| | 30 | 1 | Chocolate or toffee | 148 |
| Bed-time | 30 | 1 | Lemon juice, well strained } | 232 |
| | 60 | 2 | Glucose—water to taste } | |
| | 15 | ½ | Sweet biscuits | 78 |
| | | | Total calories, 3,474. | 3,474 |

### SUITING THE INDIVIDUAL

Diets must always be arranged to suit a patient's normal tastes and habits. It would be as stupid to arrange a high tea for someone accustomed to a seven course late dinner, as to order a working man elaborate and unaccustomed dishes. Dietetic adequacy, however, must on no account be sacrificed to patients' prejudices or poverty, and it may be necessary to obtain the almoner's help for an out-patient in order to secure for him foods which are as necessary to his recovery, eggs and milk for instance, as the drugs which are so much more readily available.

Examples of two nutritionally adequate reducing diets at medium and low cost are given below. The strict insistence on a minimum intake of fat should be noticed, as patients often err by taking even small amounts of extra butter, and then cannot understand the failure to lose weight. The reason becomes obvious when it is realized that an ounce of butter contains 226 calories, or about a tenth of the daily requirement of large numbers of men or women in sedentary occupations, and a quarter of the whole calorie value of the reducing diet given below. The form of protein is important, as in this case it is reduced to 50 grammes. A good proportion should come from animal sources such as milk, eggs, meat, fish, and cheese, whilst bread which gives vegetable protein besides carbohydrate should not amount to more than 5 oz. The animal foods will bring with them mineral salts and some vitamins also, and vitamin C will be easily supplied by the low-calorie foods such as salads, and raw fruit. When patients fail to lose weight adequately on a thousand calorie diet, a satisfactory method of securing reduction is by giving once a week a diet consisting of 100 grammes carbohydrate (just over 400 calories). This can consist of two average portions of raw fruit (20 grammes carbohydrate), and one unsweetened biscuit weighing ¼ oz. (5 grammes carbohydrate) or one portion of fruit and three biscuits at each of four meals. Unsugared tea or coffee with a little milk, and as much as desired of meat extract, marmite, or other clear soup, unsugared lemon water (saccharine may be used), and salads without dressing will complete the diet.

### *Low-Calorie Diet: Low Cost.*

*Breakfast.*

One egg, boiled or poached.

Bread, white or brown, two thin slices.

Butter or marmalade or jam, very thinly spread.

Tea or coffee (ground) with milk to taste. No sugar or sweetened condensed milk.

*Dinner.*

Meat (lean), rabbit, or steamed fish, medium portion.

Gravy without fat or thickening.

Green-leaf vegetables as much as desired.

Raw fruit.

*Tea.*

Bread, two thin slices.

Butter or jam very thinly spread.

Salad or vinegar as desired.

Tea with milk to taste. No sugar or sweetened milk.

*Supper.*

Cheese, sardines, salmon, herring, or kipper, small portion, or

Two eggs boiled or poached, or

White fish or smoked haddock, medium portion.

Bread, one thin slice, or two unsweetened biscuits.

Raw fruit or salad if desired.

Tea or coffee (ground) with milk to taste.

Butter must not exceed ¾ oz. in the day.

### *Low-Calorie Diet: Moderate Cost.*

*Breakfast.*

Fruit, raw. No sugar.

Two eggs (boiled or poached) or grilled kidney, or smoked haddock, or steamed white fish.

Bread, brown or white, two thin slices, toasted if desired

Butter, jam or marmalade, very thinly spread.

Tea or coffee with milk to taste. No sugar.

*Lunch.*

Clear soup, grape-fruit or melon. No sugar.

Lean meat, chicken, rabbit, boiled white fish, lobster, crab, as much as desired, or

Two eggs poached or baked with tomato (no fat).

Green-leaf vegetables or salad as much as desired.

Fruit, raw or cooked without sugar, as much as desired.

*Tea.*

Bread, brown or white, two thin slices (as sandwiches if desired). Tomato, cucumber, cress or egg and cress, meat extract, or Marmite may be used; or

Two small plain scones very thinly buttered, or

Four unsweetened biscuits.

*Dinner.*

As lunch.

*Lunch, dinner, or bedtime.*

3½ oz. milk may be used in soup, unsugared beverage (not cocoa) or unsugared custard, junket, or jelly or other dish containing 5 Gm. C.

Butter must not exceed ¾ oz. in the day.

From Abrahams and Widdowson, "Modern Dietary Treatment," by kind permission of Messrs. Baillière, Tindall & Cox.

### SPECIAL POINTS

By visiting patients in bed, and by gaining out-patients' confidences in discussion, a dietitian should be able to secure that most diets are taken satisfactorily. Very small changes will often make all the difference in the acceptability of meals, such as giving the right amount of milk to make tea just as it is normally enjoyed, the avoidance of foods usually disliked, and the inclusion of favourites. The serving of such foods as milk in the way he most enjoys, either as a savoury dish (white soup, e.g.), or as a sweet (pudding or beverage), will go far to make the patient happy, and to secure the effect desired from the diet.

A dietitian should be careful in carrying out the physician's prescription that she produces a diet which is nutritionally satisfactory in all respects. For instance unless special care is taken the calorie value of low protein and low-fat diets may be hopelessly inadequate to maintain weight which (unless the patient is obese) is usually desired. The protective foods may be inadequately used, and whilst the gall bladder or kidney, for instance, may be spared, the patient may lose weight and strength. In order to supply adequate calories without adding to the protein, barley sugar, jam, marmalade, sugar in all beverages, good amounts of butter, as well as puddings low in nitrogen are given in the 50 gramme protein diet at St. Bartholomew's Hospital. Sometimes the protective foods used to be omitted from a diet, and it is only in recent years that vitamin C in the form of orange or tomato juice, or medicinally as ascorbic acid, has been added as a routine matter to diets for gastric ulcer and colitis. The prolonged use of low calorie diets in gastric and duodenal ulcer is also losing favour with many specialists, with the result that apart from the medical effect on the patient there is a noticeable improvement in his contentment, and the temptation to break his diet is minimized.

Experience shows how many changes can be made in the same diet, so that with care and skill the four meals which are the landmarks of a patient's day, may become a menu of varied dishes that tempt the appetite and materially assist in the cure of the disease.

# NOTES AND QUERIES

*The Editors give below the answers to some of the many queries received during the past month which have been answered by post. It is proposed to publish in subsequent issues a selection of the more interesting questions and answers dealt with during the month, and the Editors will welcome discussions on the points raised. When referring to a question or answer already published, the number of the question should be quoted.*

## BAD DEBTS

(5) QUESTION.—A general practitioner in a provincial town writes:—

"Would you mind telling me what is the accustomed and best way of dealing with bad debts? I have just come into partnership here, and it appears to me that only about 60 per cent. of the accounts are paid. One fee for an operation in 1935 is still owing. It is pretty serious I understand in this town, and it does not bring any pressure to bear on the patient by saying that we refuse to treat them any more, because it is so easy for them to call in another doctor. I am not sure that to put a debt collector in is the right thing. I did think of getting a solicitor to send around letters. A debt collector is apt to be destructive to one's practice, and solicitors are usually expensive. The accounts are sent out quarterly, and I was wondering what the effect would be if they were sent out monthly?"

ANSWER.—In *The Practitioner*, June 1937, p. 780, Dr. Briggs writes:—

"In a better-class practice, where accounts are much larger, difficult accounts may be handed over to a collecting agency, but I prefer writing a quiet, sincere letter saying payment would be a great convenience, and asking the patient to come and discuss the whole matter, especially if the account seems to be in any way incorrect. If this produces no effect, write the debt off."

The query has also been submitted to a well-known medico-legal expert, who writes as follows:—

"I feel the wisest thing to do is to write a letter along the lines suggested by Dr. Briggs, and send it by registered post. This sometimes brings it more urgently to the notice of the recipient. If no reply eventuates, a personal telephone call might be made, and then an appointment to discuss the situation. I should not feel inclined to write it off until these efforts had been made. I do not like the employment of an agency. It may be permissible to get a firm to collect for you. In this case a note may precede the visit, saying that in future the financial side of the practice is being dealt with by Messrs. X., your accountants, and they are dealing with accounts on your behalf. Bad payers notoriously complain when accounts are submitted, and gossip can do harm. Other doctors are also willing to take them on even when they have been, as it were, blacklisted. If there is a large amount outstanding it is possible to compromise as to costs with solicitors. Monthly accounts are preferable but involve more work. I feel the first plan is the wisest, and I should try them out in that order. There is no doubt that patients dislike seeing doctors suing for fees although they may be justified. Moreover, if one sues in the end the position is made much stronger, and more sympathy is aroused if the measures I have outlined have been previously adopted."

## MACKINTOSH AND DRAWSHEET

(6) QUESTION.—The following letter was received by Miss Pearce in connection with her article "The Nursing and the Care of the Bedridden Patient" in the July issue of *The Practitioner*:—

"I read with interest your lucid and detailed article on the 'Nursing and care of the bedridden patient.' There was one point, however, that I failed to grasp, 'in no circumstances should a mackintosh be placed beneath a drawsheet.' Why is that? Is it because the clean portion of the drawsheet might be pulled into a puddle of urine?"

ANSWER.—

"I have always avoided the use of a mackintosh beneath a drawsheet in caring for helpless patients, especially those with a nervous lesion because, as I tried to bring out in my article, *moisture* is the commonest cause of bedsoreness. I would almost go so far as to say practically the only cause, and that if the skin could always be quite dry and free from moisture bedsores would not arise, but this would be too dogmatic a statement to make in a published article. To answer your question: The patient lies on the drawsheet, and a mackintosh beneath it would get very hot because it is impervious to moisture, and therefore the slight moisture from the skin being absorbed by the material of which the drawsheet is made would be retained and the patient be forced to lie on a hot, slightly moist material and both these factors predispose his skin to soreness. In no circumstances should urine be allowed to collect in the bed. Nurses can utilize all sorts of devices to avoid this, but as I was obliged to limit the length of my article I did not treat this point."

## ARTIFICIAL PNEUMOTHORAX

(7) QUESTION.—Several inquiries have been made on the question of the induction of an artificial pneumothorax in the very earliest stages of pulmonary tuberculosis. In this country the authorities have recently been discussing the problem in certain aspects (as for example at the British Medical Association Annual Meeting at Belfast). It is thought therefore to be of interest to reproduce an authoritative commentary on the subject from America as printed on the "Queries" pages of *The Journal of the American Medical Association*, June 12, 1937, cviii, 2061.

ANSWER.—

"There are still a number of tuberculosis workers who have not employed artificial pneumothorax in the treatment of minimal disease and who strongly oppose its use. There are others who have employed it and after a sufficient period of observation of their patients strongly recommend it for all progressive minimal lesions. Turner and Collins of Chicago (*Am. Rev. Tuberc.*, December, 1936) made observations on patients with minimal pulmonary tuberculosis treated by various methods and found 'that the watchful waiting policy for evidence of progression proved costly and dangerous in several cases, and even fatal in a few. Therefore, we advocate immediate induction of artificial pneumothorax in definitely diagnosed minimal cases.' After a careful study of 139 patients with minimal disease they conclude that the operative risk is negligible and that the high percentage of effective collapses guarantees good results. Thus it appears that artificial pneumothorax has a definite place in the treatment of progressive minimal, pulmonary tuberculosis. While the patient is lying in bed apparently doing well from the standpoint of absence of symptoms or even gaining in weight, the lesion may progress. Moreover, lesions may appear in the previously healthy lung while the patient is on strict rest in bed. Since collapse of the diseased area definitely inhibits the proliferation of tubercle bacilli and stimulates the formation of scar tissue, it seems logical to bring about these two desired results at the earliest possible moment. Moreover, if the lesion has not yet broken down so that tubercle bacilli are being eliminated, one may prevent this occurrence. Artificial pneumothorax should not be considered a radical procedure. Indeed, it has become a standard form of treatment. It is not as radical or as drastic as a long period of strict rest in bed which takes the patient out of all activities of life, frequently causes him to lose his position, opportunities for promotion or even his entire possessions."

# PRACTICAL NOTES

## THE CITRATE METHOD OF BLOOD TRANSFUSION

THE majority of physicians and surgeons in active practice to-day do not appreciate the remarkable simplification that blood transfusion has undergone in the past twenty years. The older members of the profession still remember the cumbersome technique which a direct blood transfusion by vessel anastomosis entailed. Much of the simplification has been due to the introduction of the use of sodium citrate as an anticoagulant by R. Lewisohn of New York. In *Annals of Surgery*, April, 1937, cv, 602, Lewisohn reviews his experience of twenty years with the citrate method. He claims with justice that the method has achieved greater popularity and wider use than any other. Most of the review is occupied with discussion of the elimination of pyrexial reactions and rigors from citrate transfusions. He points out that these can be reduced to vanishing point when their cause is realized. They are due to introduction into the recipient's circulation of foreign protein. This protein comes from two sources. The more important is that due to the presence of bacteria in the water used to prepare the citrate solution ; killing the bacteria by sterilization does not affect their property of producing rigors from " protein shock." The water used in the preparation of any solution for intravenous use must be properly distilled, and the solution must be prepared at once and sterilized and sealed before any further bacterial contamination can occur. Recognition of this most important fact was first made by McIntosh, Fildes and Dearden (*Lancet*, 1912, i, 637) but their work does not seem to have penetrated into America, and Lewisohn quotes references to American work of much later date. The other source of foreign protein which Lewisohn blames for post-transfusion rigors is from traces of blood left behind in the apparatus from former transfusions. When this blood is cooked by heat sterilization it is so changed that it acts as a foreign protein when introduced into the next recipient.

## AMBULATORY TREATMENT OF PHLEBITIS

ACCORDING to E. Stotzer (*Schweizerische medizinische Wochenschrift*, May 22, 1937, lxvii, 476) various considerations on the pathological anatomy and etiology of thrombo-phlebitis lead to the conclusion that stagnation of the blood, such as is encouraged by a spell in bed, definitely retards natural recovery. In consequence he has devised a scheme for the ambulatory treatment of such patients, even when the thrombo-phlebitis affects the leg veins, and the only exceptions are when the condition is associated with fever and severe pain on movement. A special elastoplast rubber bandage is used to compress the veins in the limb throughout its whole length. Over a period of ten years, Stotzer has treated one hundred cases of phlebitis of different types, and he has seen no example of embolism. The ambulatory treatment is begun from the very first day of the illness, and the patient is usually encouraged to keep at work and report back to hospital after about four weeks to have the bandage removed.

## SULPHONAMIDE IN GONOCOCCAL INFECTION

In the *Journal of the American Medical Association* (May 29, 1937, cviii, 1855) John E. Dees and J. A. C. Colston describe the use of sulphonamide by oral administration in nineteen cases of gonococcal infection at the Johns Hopkins Hospital. Diagnosis was confirmed by examination of urethral smears and the sediment of centrifuged urine—the three-glass test being used in cases of urethritis and cystitis. The patients received, in four divided doses a day, 4·8 gm. of sulphonamide daily, for two days, then 3·6 gm. for three days, followed by 2·4 gm. for from four to eight days. No other treatment was given. Fluids were not encouraged in excess, so that the hastening of the elimination of the drug might be avoided. Alcohol and sexual activity were prohibited. Examination of the urine for pus and organisms was carried out every two to three days. The results were most encouraging—urethral discharge disappearing in the majority of cases within one to seven days. There was a slight recurrence in one case on the fourteenth day. In several instances as the urethral discharge began to disappear the gonococci were found to lie intracellularly, and there was little or no evidence of phagocytosis by the leucocytes. In only three or four cases was there little response to the drug. Symptoms of burning and frequency disappeared in one to eight days. In four cases there was slight dizziness and lassitude following the initial larger doses. The authors give warning that immediately a complaint of dizziness and lassitude is made by the patient the dose must be reduced, and, when these symptoms persist, discontinued.

## PRESENT-DAY DIAGNOSIS OF EPIDEMIC INFANTILE PARALYSIS

Since the first appearance of poliomyelitis (Heine-Medin disease) or epidemic infantile paralysis at the end of the nineteenth century, the disease picture has considerably changed. Differential diagnosis has become somewhat difficult; but both from the point of view of prognosis and the spread of infection, an early diagnosis is of the greatest importance. In the *Schweizerische medizinische Wochenschrift*, (June 5, 1937, xxiii, 509), Otto Gsell discusses the disease picture of the present-day form of the disease, and modern methods of diagnosis and treatment. In the slight or abortive form of poliomyelitis, early diagnosis is only possible when nervous or cerebral symptoms manifest themselves. The poliomyelitis virus is secreted in the nasopharyngeal membrane, and owing to this fact quite healthy persons may act as carriers of the disease. The virus is essentially neurotropic, and the period of incubation is usually ten days. Early symptoms are slight conjunctivitis, headache, general malaise, and in some cases gastric disturbances, accompanied by fever. In a case of abortive poliomyelitis the patient may recover fairly quickly from this attack, but the infection will have been passed on. The author gives as illustration of this, the history of the spread of the disease in a family of five. In the more severe form the early symptoms are followed by spinal rigidity, and signs of meningism, with paralysis. Diagnostic measures are, the Kernig, Amoss and Lasègue signs—also in the meningism of infantile paralysis, except in severe cases, the head sinks behind the raised shoulders, in contrast to tuberculous or bacterial meningitis when it is stiffly raised. Lumbar puncture gives the surest diagnostic proof and this procedure should be carried out in all suspected cases. When a thin needle is used the patient is not unduly disturbed. The appearance of the fluid is usually clear, except in very severe cases when it may be slightly turbid. The pressure is not always raised. Blood examination reveals slight leucocytosis and an increase in the sedimentation rate, and during the course of the illness there is an increase in the albumin count. The colloidal gold reaction invariably shows an abnormal curve—but this sign may not appear until the third or seventh day of the illness—sometimes later. Early treatment with convalescent serum is recommended. Mixed serum is given intramuscularly, in a dose of 20 c.cm repeated three to four times. Out of twenty-seven cases treated in this manner by the author in the early stages, i.e. the first three days of the disease, only seven developed paralysis.

## THE TREATMENT OF RHEUMATIC ENDOCARDITIS

THE treatment of rheumatic endocarditis is of considerable clinical interest, owing to the frequency of its occurrence, and the inadequacy of combative measures. In the *Deutsche medizinische Wochenschrift* (June 11, 1937, xxiv, 928), Alfred Tillich presents an interesting article on the subject. Based on the theory of Eppinger and Siegmund, that rheumatic endocarditis originates primarily in the mesenchymal connective tissues of the valves, and is thus a serous inflammation, the author has carried out with satisfactory results the administration of potassium salicylate in the form of shock therapy, in a series of cases. The method is as follows :—For the first four or five days the patient is given no medicaments, but kept at rest in bed on a salt-free diet, or, when well-tolerated, a "raw" diet as recommended by Eppinger, i.e. a diet poor in sodium and rich in potassium. In many cases the rest in bed and potassium-rich diet causes a fall in temperature and improvement in the general condition. After four or five days the patient is given large doses of sodium, or better still, potassium salicylate. In some cases in which sodium salicylate gave poor results there was a good response to potassium salicylate. The treatment was used with success in cases of recurrent endocarditis. In polyarthritis, the treatment is carried out for fourteen days, with a day's pause every third day. In obstinate cases melubrin and novalgin, intravenously, were used concomitantly. It was noted that in cases in which pyramidon had previously proved useless, after the treatment the recurrent slight attacks of fever responded well to small doses of this drug. The results of the potassium salicylate treatment were shown by a fall in temperature, disappearance of intestinal disturbances, and improved general condition, with increased appetite. There was a decline in the sedimentation rate of the red blood corpuscles, increase of lymphocytes in the blood, and raised blood pressure. Electrocardiograms taken in twenty-one cases showed injury to the myocardium in fifteen. After the treatment further electrocardiograms showed a clearing up of the condition. Swelling and pain in the joints likewise disappeared.

## FOREIGN BODIES IN THE EAR AND THEIR REMOVAL

E. Harrison Griffin in *The Medical Record*, May 19, 1937, cxlv, 409, draws upon an extensive experience in the removal of aural foreign bodies. He advises that they are best removed by the syringe and warm water. When a patient is seen with a live insect in his ear, cure of the pain and death of the intruder are obtained by flooding the ear with pure alcohol, and removing it by the syringe and warm water. The use of forceps to remove foreign bodies which have become lodged in the ear is inadvisable as a push movement is made with the instrument before contact is made and the object is likely to be forced further back. In the removal of wax a little oil dropped into the ear and allowed to remain there a short time will often be a great help by softening the hard dry cerumen. The author cautions against the danger of using force to dislodge, by syringing, wax or foreign bodies. Again and again he has seen a ruptured ear drum caused by using force with the syringe. Better to take an hour and let the patient leave with his hearing, than use force, resulting in a punctured ear drum and a condition that may be permanent.

## A SIMPLE PLIABLE FINGER SPLINT

A SIMPLE and easily applied finger splint is described by John E. Burch in *The Journal of the American Medical Association*, June 12, 1937, cviii, 2036. The splint consists of a parallel row of wooden applicators impinged on a layer of adhesive tape, with a similar layer superimposed. A small margin is left on each side and folded over, making the splint water-tight. The author has constructed two sets of splints—one inch width and two inch width. The former is for use in infections of the finger tip, such as whitlows, paronychia and nail avulsions. When using the splint for a whitlow it is necessary to apply it to the volar surface of the finger to avoid possible injury to the finger-tip. In nail avulsion and paronychia the splint is applied to the dorsal surface. It is not necessary to remove the splint when soaking the finger, it is also water-tight and retains the moisture of a wet dressing. The one inch splint can also be used for phalangeal fractures. The two-inch is for immobilizing the thumb and little finger. The chief advantages of these splints are :—the cheapness and easy procurability of the material, the elasticity and lightness for curved surfaces, and the lack of unnecessary padding—the splint can easily be kept in place with a simple gauze bandage.

## WHOLE BLOOD TREATMENT FOR PNEUMONIA

IN *Le Progrès médical*, June 5, 1937, xxiii, 689, R. Pierret describes the excellent results obtained in cases of capillary bronchitis and bronchopneumonia in children, by intramuscular injections of parental blood. Hyperthermia, asphyxia, and thread-like pulse disappear after the first injection, and after four days' treatment a cure is usually obtained, the child rapidly putting on weight and regaining appetite and vitality. Hospital cases have not been so satisfactory, partly no doubt due to the conditions of hospitalization, and also owing to the fact that the blood used for the transfusion is at times carried out from a donor. The method is simple and can be carried out in all cases of bronchopneumonia, and the intramuscular injection of small quantities of blood have not caused any vascular disturbances. The method employed is as follows :—A sterilized syringe of 10 c.cm. is used with a needle sufficiently large to permit of the easy obtaining of the donor's blood, and the immediate injection of the blood into the buttock or the external surface of the thigh of the infant. The first injection should be 10 c.cm. which may be repeated during the next three or four days according to the severity of the case. If the absorption is slow the later injections may be of less quantity (5 c.cm.).

# REVIEWS OF BOOKS

*The Citadel.* By A. J. CRONIN. London: Victor Gollancz, 1937. Pp. 446. Price 8*s.* 6*d.*

THIS is a well-written novel with much incident and many character sketches graphically portrayed by a medical man with high qualifications. It tells the story of a poor, but idealistic, young Scottish graduate who becomes an assistant in a Welsh mining village and makes good in spite of an unpleasant environment. He marries a school teacher who is his good genius, and then enters on the second stage of his professional life in a more or less independent position in another mining district, where he again makes good but also a number of enemies by declining to sign certificates for lazy, but healthy, miners. This is the most satisfactory period of his life, for happy with his wife he gains the M.R.C.P. and by a research on the lung disease of anthracite miners secures not only his M.D. at St. Andrews, but a wholetime post under the "Coal and Metalliferous Mines Fatigue Board" in London. Full of energy his hopes of good work, at what he finds to be a sleepy circumlocution office, are dashed, and he resigns to find himself again face to face with a struggle for a livelihood. Obtaining a death vacancy in a somewhat poor neighbourhood in London, he now becomes more interested in money than in medical research, and more or less in touch with a ring of financially able practitioners in the Harley Street area, who exploit neurotic women, practise dichotomy and, it is suggested, abortion. As he becomes fashionable, he and his wife drift apart, but a professional catastrophe, due to the incompetence of one of the ring, whom he called in to operate on a patient, pulls him up and, repenting, he decides to leave London and start afresh in the country. This brings him and his wife together again, but tragedy awaits him; she is killed by an omnibus and later he is brought up before the General Medical Council on a charge of "infamous conduct in a professional respect," as a revenge on the part of the ring from whom he had broken away. The General Medical Council, however, did "not see fit to direct the Registrar to erase his name from the Medical Register," and the book closes with his departure to practise group medicine with two tried friends in the country.

This novel has had a sensationally good press and will have done a bad service to the profession if it is taken, as it possibly may be, by the lay public to justify a general condemnation of medical men living around Cavendish Square. Among the able character sketches many are far from charitable, few that suggest honest worth. There is a precautionary statement that "every character, place and institution in the book is entirely fictitious and no reference whatever is intended to any living person." Readers will be able to judge how much poetic licence must be admitted, but many will fancy that they can recognize the original models.

*Drug Addiction.* By E. W. ADAMS, O.B.E., M.D. Oxford University Press. London: Humphrey Milford, 1937. Pp. xv and 173. Price 8*s.* 6*d.*

As a Medical Officer of the Ministry of Health and as joint secretary of the

Ministry's Departmental Committee on Morphine and Heroin Addiction, Dr. Adams has had special opportunities which he has not only utilized to the full but supplemented by a wide and critical survey of what has been written on the vast subject of addiction. Though thoroughly practical and a mine of information, especially on treatment, for the practitioner, this book's bibliography of nearly three hundred items, extending from Homer to the present day, is a most valuable source of reference for every one interested in the subject. Pleasantly written and with touches of humour here and there, it contains much curious knowledge; for example, Cowper's well-known and often wrongly quoted phase, "the Cups that cheer but not inebriate," was quietly borrowed from his senior, Bishop Berkeley, who thus described his panacea of tar water. The use of the word " addiction," as describing the drug habit, is much more modern than might be expected, as it probably is not thirty years old. Though drug addiction is world wide in its distribution, it is comparatively rare in this country, and certainly not nearly so frequent as many people imagine. Addicts of tea and coffee receive attention, and a quotation from Robert Burton's "Anatomy of Melancholy" is introduced to show that coffee addiction may have existed among the Turks in the late Middle Ages.

*Treatment of Some Chronic and "Incurable" Diseases.* By A. T. Todd, O.B.E., M.B., M.R.C.P. Bristol: John Wright, 1937. Pp. viii and 203. Price 10*s*.

In an independently expressed introduction Dr. Todd, who is physician to the Bristol Royal Infirmary, makes a critical comment on the tendency to demand a single cause for each disease—the attempt at the unification of etiology—and insists that there cannot be disease of one system unless all the other systems are also affected more or less. Thus a patient with disease of the joints should properly be described as "this sick person has maximal symptoms in his joints."Chronic diseases are of complex etiology, and a search must be made for disorders in every part of the body in order to treat them efficiently. About sixteen chronic or "incurable" diseases are considered, beginning with diabetes mellitus in which synthalin has cured ten times the number of cases cured by insulin; it is given in pill form and its action is slow in having its effect for the urine may not show any change for two weeks; if given in too large doses it may be dangerous, and accordingly careful directions are given for its use. In the chapter on epilepsy reference is made to tobacco smoking as a cause, though in a few cases only. Toxic goitre is regarded as a pluriglandular syndrome and medical treatment is fully described. The treatment of inoperable cancer by colloidal lead selenide, on which the author has been engaged since 1926, in conjunction with X-radiation is described in some detail, and an explanation of its method of action is set out.

*Modern Psychology in Practice.* By W. Lindesay Neustatter, B.SC., M.B., B.S., M.R.C.P., with a Foreword by R. D. Gillespie, M.D., F.R.C.P., D.P.M. London: J. & A. Churchill, Ltd., 1937. Pp. xv and 299. Price 10*s*. 6*d*.

This is a thoroughly practical textbook on the elementary aspects of applied psychology, and the author's obvious wide experience, together with his sincerity, make it a convincing book which can be unreservedly recommended to all practitioners of medicine. It is easily read and anyone who has read it will be in a better position to deal with the psychological problems of daily practice. The section on children's disorders (with a chapter on vocational guidance by Mr. J. Jennings, M.A., of the Institute of Industrial Psychology) is full of commonsense advice and more sanity than is usually present in modern writings on the psychological disturbances of childhood. It is also refreshing to note a plea for methods which take a shorter time than some of the complicated procedures recommended on the other side of the Atlantic. There is a useful general section at the end of the book which contains a discussion on causation and prophylaxis in relation to psychopathological disorders and a chapter on "The Law and Some Problems of Disposal."

*Physical Diagnosis.* By DON C. SUTTON, M.S., M.D. London: Henry Kimpton, 1937. Pp. 495. With 298 text illustrations and 8 colour plates. Price 21*s.*

THIS is a clearly written account of the modern clinical (including radiological) methods available for estabilishing the diagnosis of disease, well illustrated and with a good index. The author is clearly experienced in the instruction of students and his outlook is essentially practical. An innovation in books on this subject is the interesting chapter on the historical development of clinical methods of diagnosis.

*Modern Dietary Treatment.* By MARGERY ABRAHAMS, M.A., M.SC., and ELSIE M. WIDDOWSON, B.SC., PH.D. London: Baillière, Tindall & Cox, 1937. Pp. ix and 328. Price 8*s.* 6*d.*

THIS is a concise collection of diet tables, recipes and valuable general instruction on the modern interpretation of scientific work on nutrition. Introductory chapters on general principles lead on to sections on special subjects—high and low calorie diets, invalid diets, diets in diseases of the alimentary system (with a wide range of disguises for milk in ulcer cases), in diabetes, in diseases of kidneys, in disturbances of mineral metabolism and various other disorders. There is a useful chapter on diets for Jewish patients and a clear exposition of the preparation and use of food tables. Among a large number of new books on diet this volume stands out for its clarity and completeness.

*Reports on Chronic Rheumatic Diseases.* No. 3. Edited by C. W. BUCKLEY M.D., F.R.C.P. London: H. K. Lewis & Co., Ltd., 1937. Pp. x and 131. Price 10*s.* 6*d.*

THIS third annual report of the British Committee on Chronic Rheumatic Diseases contains several articles of considerable interest. Professor C. C. Okell discusses the treatment of rheumatoid arthritis with vaccines, and Professor J. R. Learmonth gives an excellent account of the results obtained by sympathectomy in certain types of arthritis. Dr. Gunnar Kahlmeter (Stockholm) contributes a most interesting article on X-ray therapy in chronic arthritis, which he considers to be the treatment of choice in arthritis of gonococcic origin. A review of recent American investigations on diseases of the joints is given by Dr. Philip S. Hench, and the final article by H. E. Archer and G. Discombe on the possible dangers resulting from the administration of some drugs in rheumatic disorders includes a section on the danger of certain drugs of the benzene group.

### NEW EDITIONS.

THE fifth edition of the well-established *Textbook of the Practice of Medicine*, edited by F. W. PRICE, M.D., F.R.C.P. (Humphrey Milford, Oxford University Press, 36*s.*) has undergone extensive revision and changes, some of which are necessitated by the premature death of valued contributors. The fine articles on diseases of the nervous system by the late Dr. W. J. Adie and J. S. Collier have been revised by Dr. F. M. R. Walshe, and the editor has also been fortunate in enlisting the services of Professor J. W. McNee especially for the article on diseases of the spleen and the reticulo-endothelial system. With the editor's careful revision the size of this popular textbook has not increased much in size. There is also an edition on Indian paper at 45*s.*

A SINCERE welcome will be accorded to the second edition of *Diseases of the Heart* by SIR THOMAS LEWIS, C.B.E., F.R.S., M.D., F.R.C.P. (Macmillan & Co., 12*s.* 6*d.*), for since it first appeared over four years ago it has been recognized as the most sound and practical volume on the subject available for students and practitioners. It has now been thoroughly revised and all advances judged to be of value have been incorporated.

*The Abdominal Surgery of Children* by SIR LANCELOT BARRINGTON-WARD, K.C.V.O., CH.M., F.R.C.S., in its second edition (Oxford University Press, 25*s.*), has been rewritten in some sections and amplified in others. A description of intravenous saline administration has been added and the appendix also contains some useful remarks on anæsthesia for abdominal operations in children by Dr. N. McDonald.

*The Diagnosis of Nervous Diseases* by SIR JAMES PURVES-STEWART, K.C.M.G., C.B., M.D., F.R.C.P., now issued in its eighth edition (Edward Arnold & Co., 35*s.*), has been rewritten in several places, and many new illustrations added. The chapter on intracranial tumours is now very complete and contains, among other additions, sections on angio-radiography and opaque ventriculography for diagnostic purposes. There is a description of the manometric test in the chapter on the cerebrospinal fluid, and in chapter III the Stanford revision and extension of the Binet-Simon tests has been added. There are many other valuable additions, and some of the new illustrations are excellent.

*Disorders of the Blood* by LIONEL E. H. WHITBY, C.V.O., *M.C.*, M.A., M.D., F.R.C.P., and C. J. C. BRITTON, M.D., D.P.H., is now presented in its second edition (J. & A. Churchill, Ltd., 21*s.*). The work has been considerably extended, and several new illustrations added. The authors stress the value of classifying the anæmias in terms of cell size and hæmoglobin concentration. The chapter on hæmagglutination and blood transfusion, which include blood tests for paternity, criminal investigation and blood transfusion, is remarkably comprehensive and of considerable practical value. Chemical poisons and their relation to the leucoses are described in detail, including that of secondary agranulocytic angina. Some additional plates appear in this edition and are excellently produced.

THE second edition of the monograph on the *Surgery of the Sympathetic Nervous System* (Baillière, Tindall & Co., 16*s*.), by PROFESSOR GEORGE GASK and his successor, PROFESSOR J. PATERSON ROSS, which originally came out in 1933, records their further experience gained from the results of their operations and those of other neuro-surgeons. The most important new features in this edition are the sections on the clinical grading and prognosis of Raynaud's disease, on the recognition of localized structural disease of the main arteries, on afferent pathways in the sympathetic system, and on sympathectomy for dysphagia. The authors' present opinion is that the late result of sympathectomy depends mainly on the nature of the disease and not, as they had previously supposed, on the powers of the sympathetic to regenerate.

*Medical Emergencies* by CHARLES NEWMAN, M.D., F.R.C.P., in the second edition (J. & A. Churchill, 8*s*. 6*d*.), has been revised throughout and rewritten in places. Sections on coma in hot climates, asthma, and the treatment of hæmoptysis by artificial pneumothorax have been included, and an addition of especial interest is the section on agranulocytosis. Gas-poisoning, including by war-gases, is discussed in detail, and the methods for blood-grouping for transfusion have been brought up to date.

*Synopsis of Obstetrics and Gynæcology* by ALEC BOURNE, M.A., M.B., B.CH., F.R.C.S., F.C.O.G., appears in its seventh edition (John Wright & Sons, Ltd., 15*s*.). Several alterations in accordance with modern progress have been made in the obstetrical and gynæcological sections. The treatment of puerperal infection with prontosil-S is included, and mention is made of the use of mandelic acid for the treatment of pyelitis of pregnancy.

*Minor Maladies and their Treatment* by LEONARD WILLIAMS, M.D., in its seventh edition (Baillière Tindall & Cox, 10*s*. 6*d*.) contains an entirely new chapter on dietetics. The whole book has been carefully revised and some of the material transposed in order to adapt it to modern progress. An interesting section is that devoted to heat-stroke and sunburn and the dangers of over indulgence in sun-bathing. The chapter on minor glandular deficiencies has also been brought up to date.

THE third edition of DR. L. S. T. BURRELL'S *Recent Advances in Pulmonary Tuberculosis* (J. & A. Churchill, 15*s*.) bears witness, if it were needed, of its success among practitioners for whom with students it is intended. It contains new chapters on infectivity and immunity, on bovine and childhood tuberculosis, and on classification and types of pulmonary tuberculosis. The last-mentioned chapter includes an interesting account of chronic miliary tuberculosis, the existence of which was recently established by radiography; this subject is illustrated among the numerous radiographic plates nearly all of which are new.

# NOTES AND PREPARATIONS

## MEASLES SERUM

THE London Fever Hospital has pointed out that owing to the great difficulty in obtaining a large amount of convalescent measles serum, its small supply, while always available for the general public, has to be reserved for young children and more especially for weakly and ill children in whom an attack of measles would be dangerous. It is impossible to supply this serum for every contact. We have been asked by the Hospital to publish this in order to avoid the disappointment of a refusal when the serum is required to protect older people. The Resident Medical Officer is, however, always glad to hear of cases in which the serum can be rightly used.

### NEW PREPARATIONS

**ALLENBURYS SULPHONAMIDE P**—(Para-aminobenzene-sulphonamide) for use in puerperal infections, streptococcal septicæmias, erysipelas, tonsillitis, otitis media, streptococcal meningitis and pneumonia. This new preparation is supplied in tablet form—bottles of 25 and 100, price 2*s.* 9*d.* and 9*s.* respectively. Each tablet contains 7½ grains (0·5 gm.) para-aminobenzene-sulphonamide, and the recommended dosage is 2 to 3 tablets three times a day, reduced as the symptoms subside. Full particulars and literature dealing with this production can be obtained from Messrs. Allen & Hanburys, Ltd., Bethnal Green, London, E.2.

**ALOMIN.**—This is an antacid and adsorbent powder for the treatment of diseases of the digestive tract, composed of kaolin (24 grammes) aluminum hydroxide (24 grammes), calcium carbonate (16 grammes), bismuth subcarbonate (16 grammes), sodium chloride (3 grammes), acacia (6 grammes) with aromatics and dextrose. The average dose is one tablespoonful mixed in water. The preparation is made by Messrs. Eli Lilly and Company, 2–4 Dean Street, London, W.1.

**BETALIN COMPOUND** is a synthetic preparation of vitamin $B_1$ and $B_2$, recommended for the treatment of neuritis, beri-beri and nutritional deficiencies. It is supplied in bottles of 40 and 500 capsules, each capsule containing 200 Sherman units of vitamin $B_1$ synthetic and 40 Sherman units of vitamin $B_2$ complex (from liver-stomach concentrate). The manufacturers are Messrs. Eli Lilly and Company, Ltd., 2–4 Dean Street, London, W.1.

**GLUCO-FEDRIN.**—This is a solution of ephedrine (1 per cent.), chloretone (0·5 per cent.) and menthol (0·1 per cent.) in dextrose. It contains no oil, is non-irritating and is pleasant to use. The solution may be used from a nebuliser, but it may also be applied directly to the nostrils by means of a dropper or on gauze swabs. It is indicated for the production of shrinkage of the nasal mucous membrane in all types of inflammatory conditions of the nose and accessory sinuses. Parke Davis and Company, Beak Street, Regent Street, London, W.1, are responsible for this new preparation, which is available in bottles of 10 c.cm. complete with glass dropper.